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VOLUME 140 NO. 5 • FEBRUARY 4 1961

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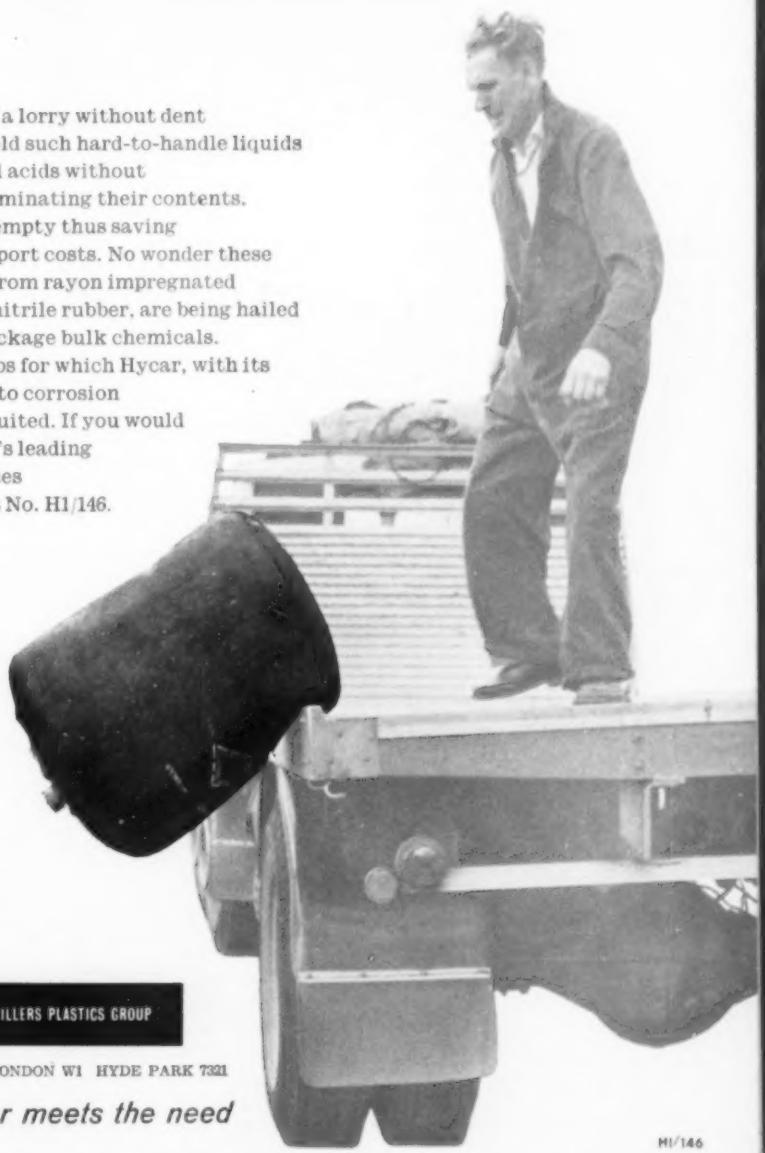

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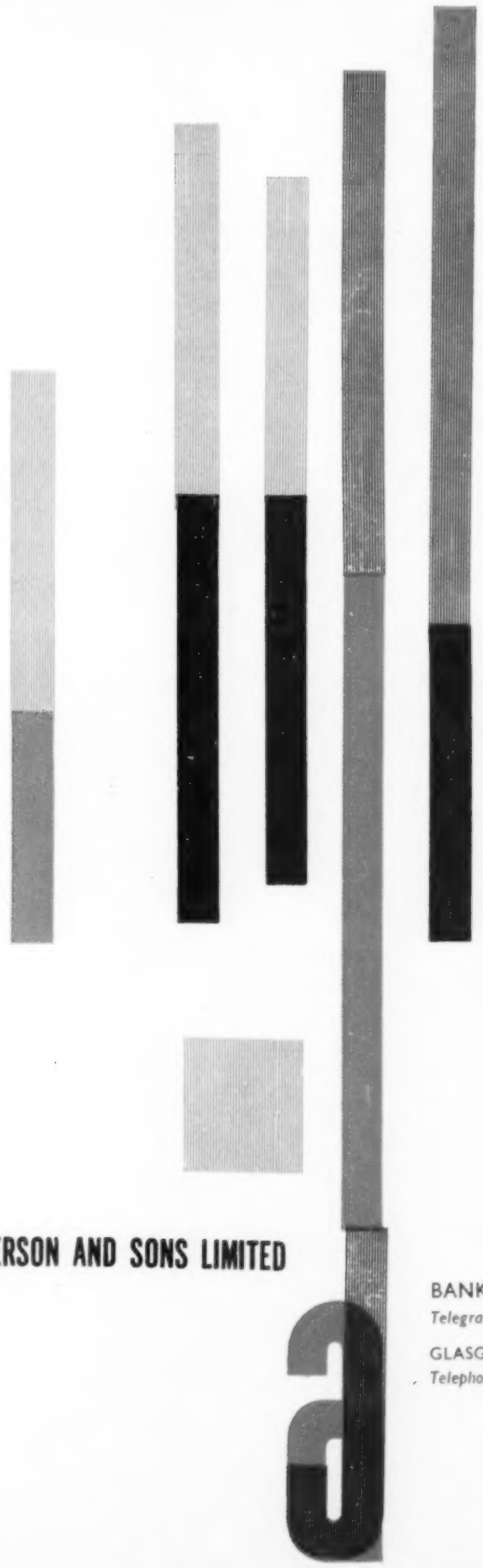

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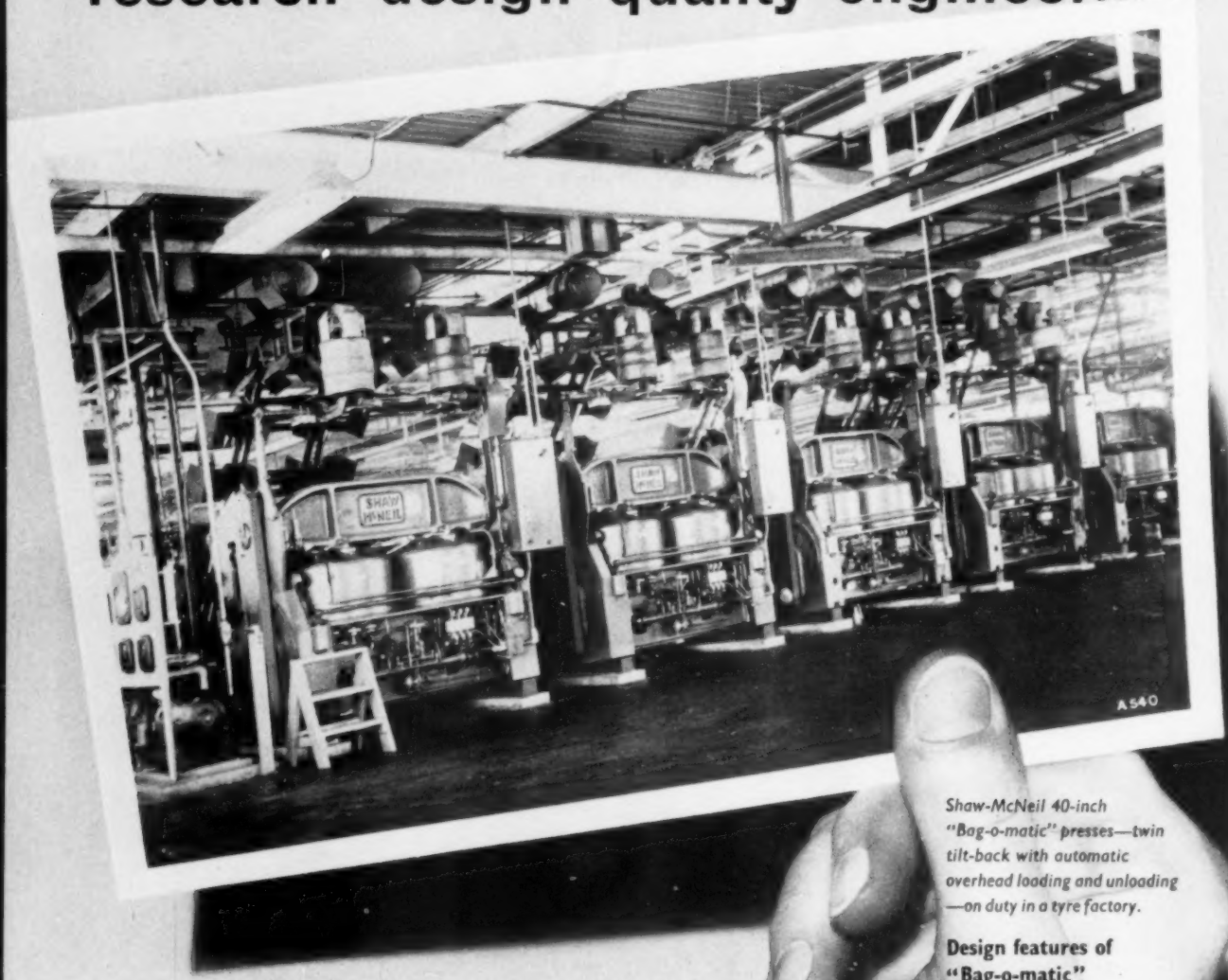

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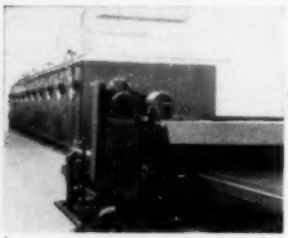

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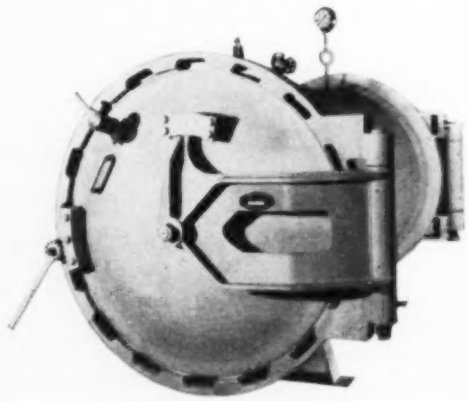

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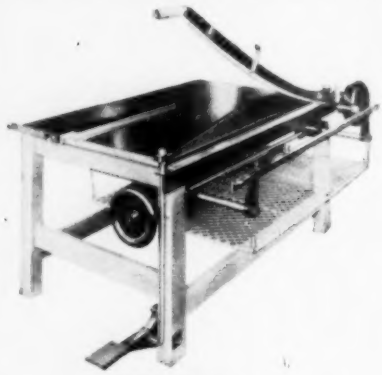

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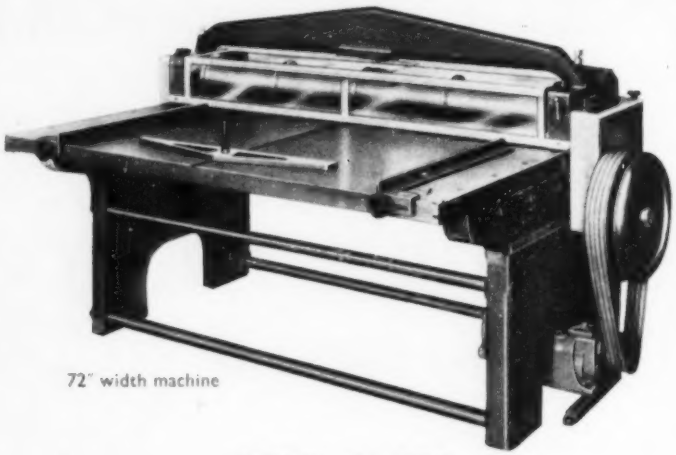

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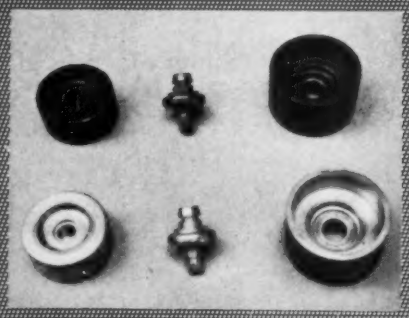

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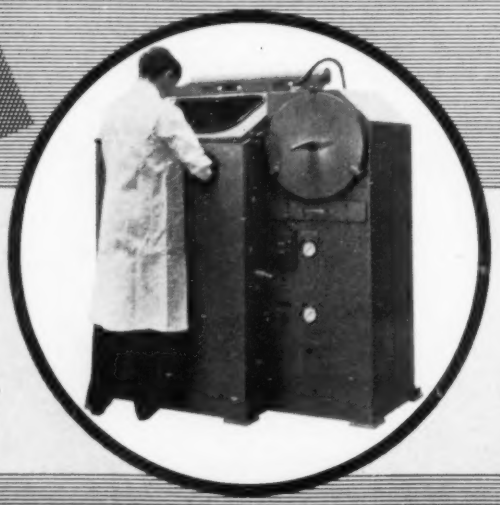

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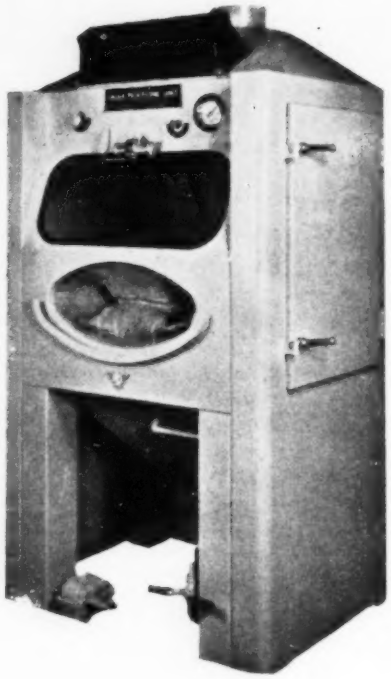

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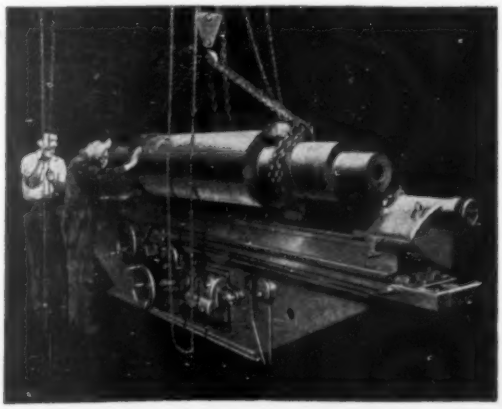

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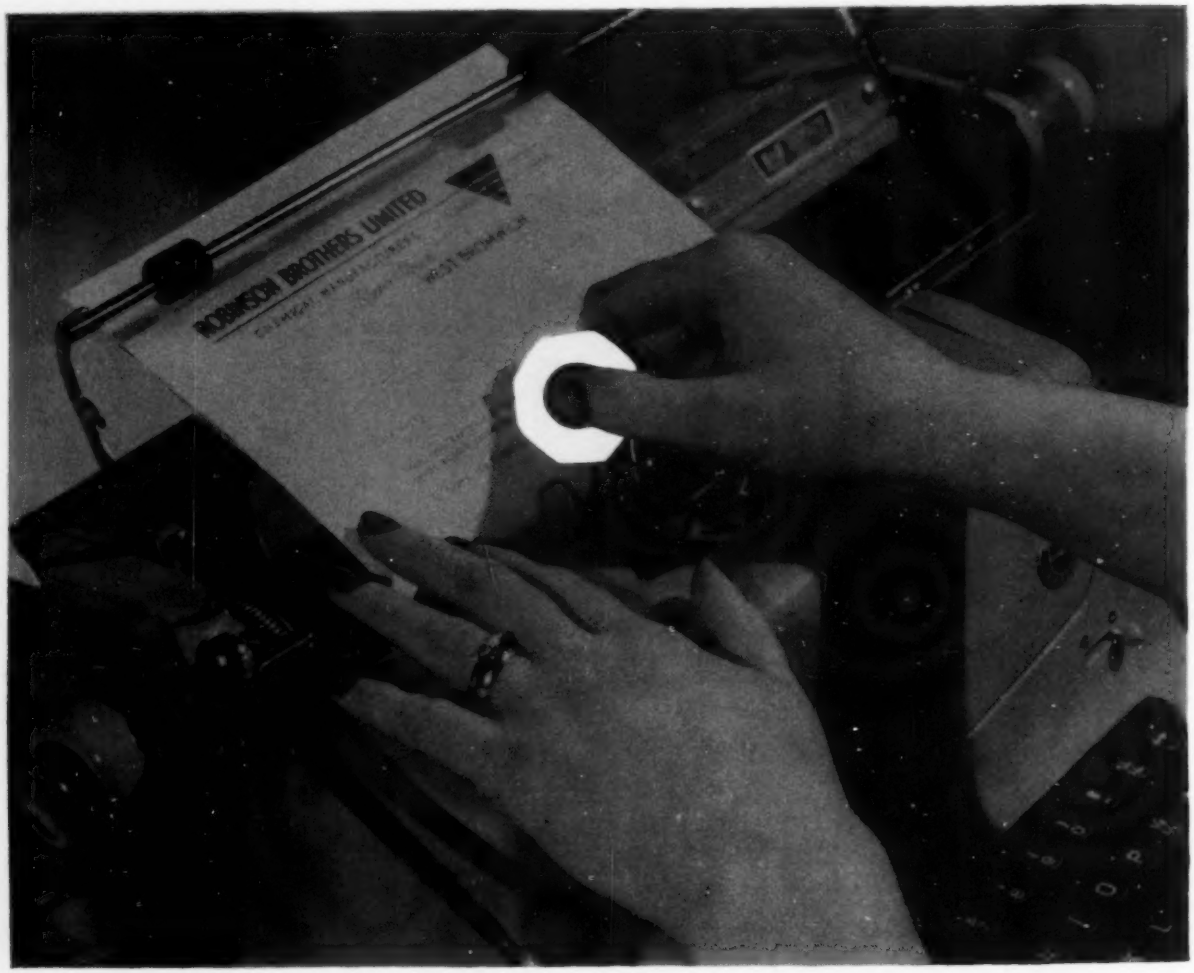

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Volume 140 *IN ITS 77th YEAR* **No. 5**

February 4 1961

Editorial

NOTES OF THE WEEK 167

Articles and News

NEWS BRIEFS 168
POLYMER FORMS FRENCH COMPANY 170
A NEW LOOK AT FACTICE 172
THAWING NATURAL RUBBER IN UNDER AN HOUR ... 173
POLYMERS OUT IN SPACE 174
TECHNICAL SERVICE AT ISR 180
PLASTICS INVADE THE HOME 183
IRI NEWS 189

Features

VIEWS AND REVIEWS 184
MEN AND MATTERS 187
THE LEGAL ANGLE 188
PLASTICS STATISTICS 189
PATENT SPECIFICATIONS 190
RUBBER STATISTICS 190
RUBBER AND PLASTICS STOCK MARKET 193
RUBBER MARKETS 194
INDUSTRY INTELLIGENCE 195
SYNTHETIC RUBBER PRICES 196
TRADE MARKS 197

Classified Advertisements . . . 198 Advertisers Index . . . 202

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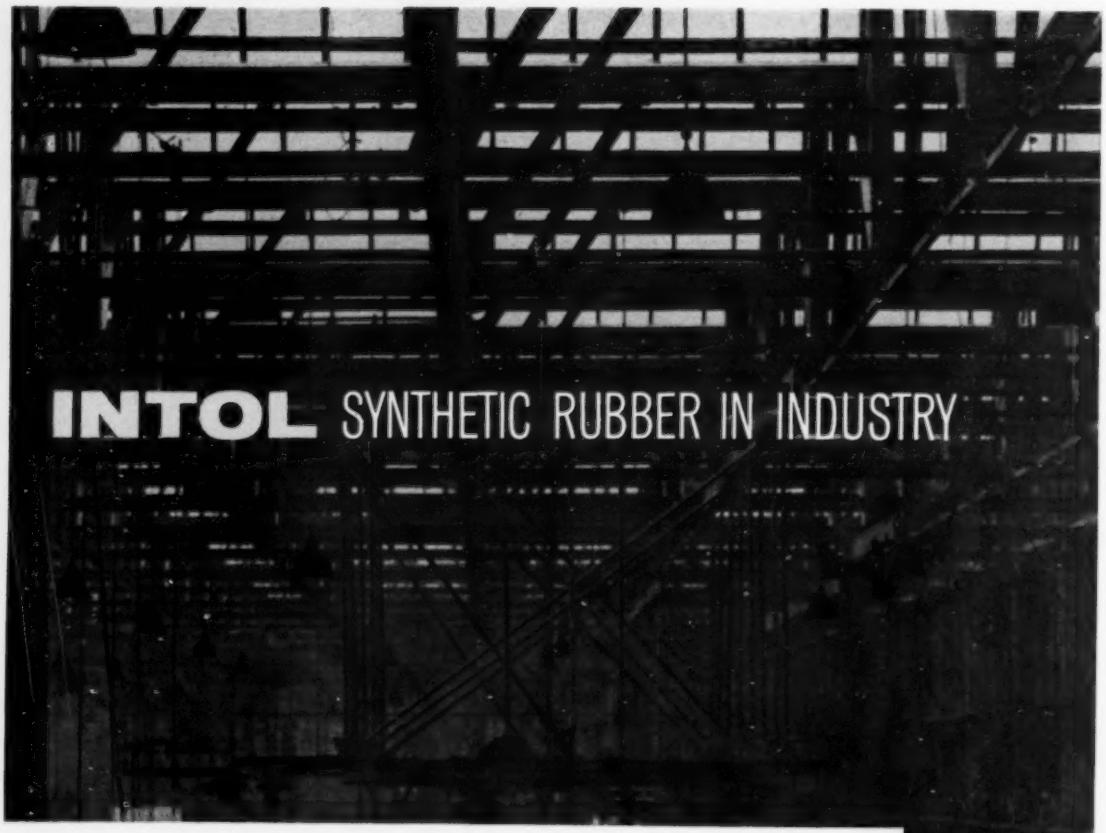

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NOTES of the WEEK

A Very Fine Trumpet

'JUSTICE must not only be done—it must be seen to be done' we are often reminded. The reasoning behind this applies to other fields as well as to justice. In industry we must not only produce, but show what we have produced. As Charles Jennings points out in this week's Views and Reviews, the polymer industry, while it is not slow on 'direct' publicity where the returns are more evident, could well do more in showing itself and its achievements to the general public and to other industries. There is a first-class and often exciting story to tell.

Promotion of this kind would not only lead the public to understand the industry better and to realize the advantages—and, perhaps more important, the present limitations—of rubber and plastics products, it could pave the way for future developments. Developments, for example, in such fields as structural plastics for building.

The only drawback to carrying out such a scheme is the usual one: money. Promotion of this kind would depend upon assistance from every firm in the industry, but we can be sure that every firm would benefit. Since the last war plastics have slowly built up a good name for themselves. Inferior materials have slowed up the process, whereas no-one would dream of saying that wood was a poor material from looking at one piece of it, or of condemning steel from one faulty component, pvc in general has often been damned after experience of perhaps one roll of sub-standard material. If it had been possible in those early post-war years to run a general promotional scheme, acceptance would have been easier. The position is very much better now, of course, but there is still a lot of work to be done and prejudice to be overcome. The industry has a very fine trumpet. There is no reason why it should not blow it.

Functions of the Federation

AN excellent booklet that makes sure that rubber manufacturers can 'see what is being done' has been published this week by the Federation of British Rubber and Allied Manufacturers, in connexion with the decision that the Federation should change over to direct membership by individual firms from April 1 1961. Called 'Why a Federation' the booklet describes concisely the functions which FBRAM carries out for its members and for industry as a whole. 'They are practical functions. They affect costs. They affect sales. They affect opportunity. They affect goodwill. If they were allowed to lapse, the loss to any individual firm might not be reflected in the first year's balance sheet, but would become increasingly felt in a gradual insidious deterioration in the whole climate of trade and industrial relationships.'

People in the rubber industry who see only one particular facet of the Federation may be surprised to see from the booklet the range and the diversity of the problems the Federation tackles. It supplies export statistics and information; represents the industry on many bodies, including the Federation of British Industries; negotiates for lower transport costs, and keeps a constant watch on the raw material position (for example it has been working for some time towards the establishment of a single international system of grades of natural rubber). Nowhere does the value of combined action show up better than in the preparation of standards and specifications, and the publication of a 'Guide to the Drafting of Specifications for Rubber Products' is a recent example of the valuable work that the Federation has done in this field.

Attractively printed and illustrated (there are some particularly good line drawings), the booklet can be obtained from the Federation at 43 Bedford Square, W.C.1, and should be read by everyone in the industry —particularly by any manufacturers who are still hesitating on the brink of applying for membership.

Polymers in Space

WHEN the 'horseless carriage' was invented people were at first amazed and then treated it as a noisy curiosity that would not go very far. They were also amused and sceptical when the first 'heavier than air machines' tried to stagger off the ground. Rockets, sputniks and luniks, however, have been accepted with comparative equanimity. Perhaps by now we have been surprised too often. However that may be, the lag between the invention and the realization of the commercial possibilities has been much smaller.

Since cars and aeroplanes have proved to be large users of rubbers and plastics, what prospects are there in rockets? Two years ago Dr N. H. Langton of the National College of Rubber Technology, who is a council member of the British Interplanetary Society, participated in articles in *RJIP* examining these prospects. Since that time much more information has become available. In this issue we print the first of two further articles by Dr Langton on polymers in space, in which he shows that there are a large number of applications, from adhesives and artificial dielectrics to space suits and seals. Space, in fact, is already a fair-sized industry so far as polymers are concerned: it is estimated that the solid fuel business alone in USA will be worth $250m. next year, and already employs more than 50,000 people.

NEWS *Briefs*

ARGENTINE TERYLENE PLANT—GOODRICH-GULF DIENE ACTIVITY — HOUDRY BENZENE PROCESS BLACK IN VENEZUELA — INDIAN PLASTICIZERS

●**India** — A company known as Indo-Nippon Chemical Co. Ltd. has been formed in Bombay to undertake manufacture of plasticizers like DHP, DOP, DIOP, DBS and DAP. Gandhi Parekh Investment Corporation Private Ltd., has, in collaboration with Japan Cotton and General Trading Co. Ltd., of Osaka, formed the company with an authorized capital of Rs.50 lakhs (£375,000). The plant will go into production by February 1961 and will produce about 900 tons of plasticizers per year. Application has been made to the Government for doubling its capacity in view of increasing demands for plasticizers in the country.

●**United States** — General Services Administration officials said in Washington they had no plans 'in the immediate or foreseeable future' to rotate rubber stocks in Government stockpiles. The officials also denied that there were any plans to remove the 30 cent ceiling which prevents GSA from selling rubber when the price is below that figure.

●**Indonesia** — Indonesia is recovering from heavy floods which have devastated large areas from Djakarta to South Borneo, driving hundreds of thousands from their homes. Thousands of acres of farmland are still under water. The damage done to rubber crops has not yet been estimated.

●**Holland** — Trelleborgs Gummifabriks AB of Trelleborg, Sweden, has established at Hoogezand-Sappemeer a company called Trelleborg Rubberfabrieken NV, which will start operating a rubber factory producing accumulator boxes. Construction and equipment of the new factory will require an investment of about 7m. guilders.

●**Israel** — Plastic water pipes manufactured by the Plastics Factory in Kibbutz Merhavia, under a Swiss patent, have for the first time been used by the Jerusalem Municipality in a new housing project.

●**United States** — Goodrich - Gulf Chemicals Incorporated has said it will begin construction immediately of a new multi-million dollar plant to produce its Ameripol CB polybutadiene rubber in Institute, West Virginia. The company, jointly owned by B. F. Goodrich and the Gulf Oil Corp., has also disclosed that it has licensed two other producers to use its process for making the material.

●**Tanganyika** — The Tanganyika Government is looking for investors in new rubber estates which it is hoping to establish in the Kilombero Valley. A spokesman said that the area was suitable for the production of high-quality rubber. Sufficient surface and underground water was available. 'We are trying to attract people with the know-how of rubber production though no definite schemes have yet been launched,' he added. A £2m. tyre factory is being built in Tanganyika by Michelin.

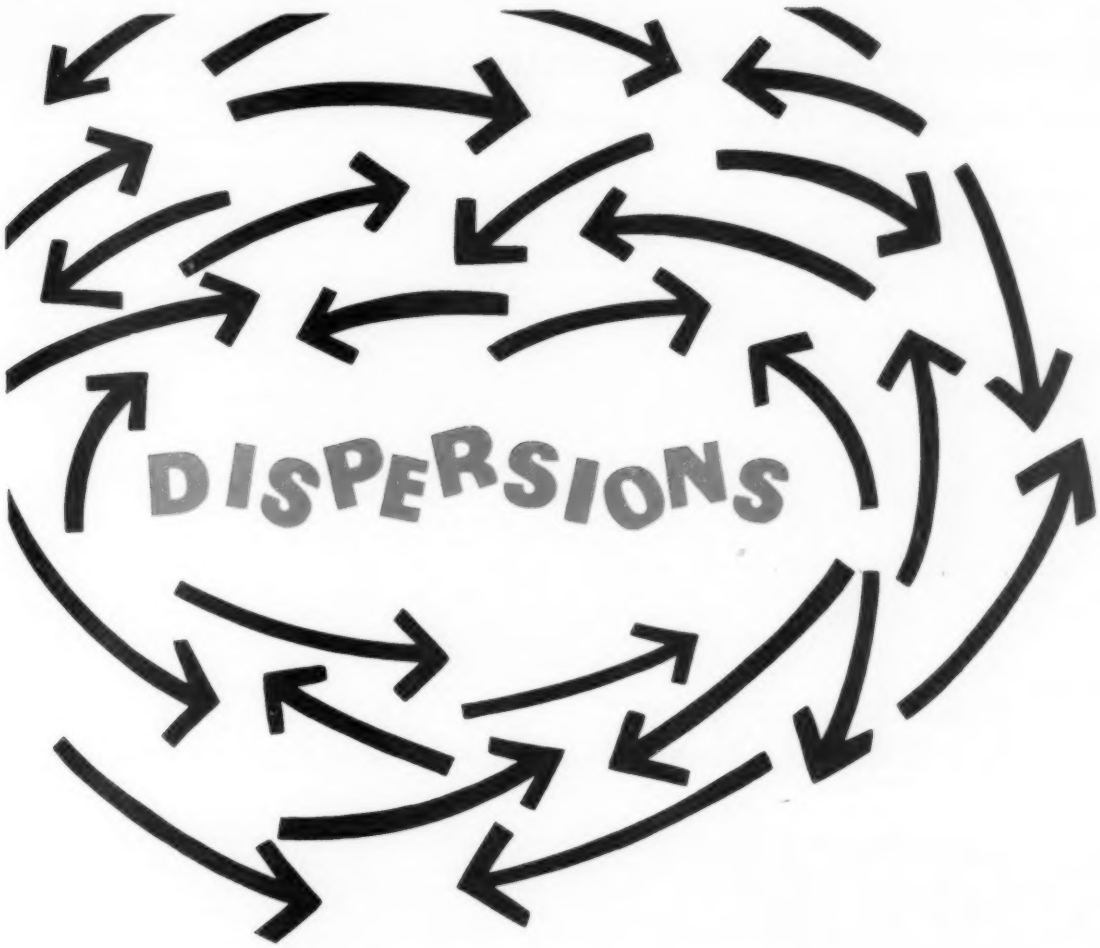
●**Argentina** — Industrias Quimicas Argentinas Duperial SA, the Imperial Chemical Industries subsidiary in Argentina, is to make Terylene at Duperial's new industrial centre in San Lorenzo. The new plant — which represents an investment of around £1½m. — will have an initial capacity of 2m. lb. a year. Financed by the parent company it will bring total I.C.I. investment at San Lorenzo over the next three years to almost £10m.

●**Venezuela** — United Carbon Co. has announced plans for the construction of a $3m. carbon black plant in Venezuela. The plant will be completed late this year and will have an initial capacity of 20m. lb. annually. It will be operated by United Carbon de Venezuela, CA, and will be located in Valencia, 75 miles south-west of Caracas. The contract for engineering and construction has been awarded to Lummus Company of Houston, Texas.

●**Ceylon** — A general 5% increase in duty on all imported wares has been made by the Ceylon Government. In addition, sharp increases in duty have been imposed on a number of items, including rubber tyres and tubes.

●**United States** — Development of a new catalytic de-alkylation process named Detol has been announced by Houdry Process Corp. It is said to be a highly selective process producing close to theoretical yields of benzene when de-alkylating alkyl benzenes such as toluene and xylenes. The first licence for the new process has been granted to Crown Central Petroleum Corp. of Baltimore and Houston, which is building a plant designed to produce 17m. gallons of benzene per year.

'— furthermore, it can be nailed, planed, bored and sawed — just like plastic!'— 522



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Polymer Forms French Company

10,000-TON STRASBOURG PLANT TO BE ON STREAM IN 1962

POLYMER Corporation of Sarnia, Canada, has formed a French company to run the synthetic rubber plant which, as previously reported, it is to build in France. This was announced by Dr E. R. Rowzee, president and managing director of Polymer, at a luncheon last week in Strasbourg, France.

The company, Polymer Corporation (SAF) has been formed in partnership with the Banque de Paris et des Pays-Bas, and has a share capital of 26.8m. new francs (£1.9m.).

The directors are: Dr Rowzee (chairman); J. P. Fontaine (Banque de Paris et des Pays-Bas); R. E. Hatch (Polymer Corp., Sarnia); F. Vernhes (Societe Française Polysar, Paris), and S. Wilk (Polymer Corp., Sarnia).

Ideal Situation

R. E. Hatch, who remains as vice-president, marketing, of Polymer, Sarnia, is president of Polymer Corporation (SAF). S. C. Kilban'k has been appointed general manager of the new company.

Construction of the plant, designed to produce 10,000 long tons per year of specialty rubbers, is scheduled to begin by early summer 1961 on a site of 70 hectares near Strasbourg. It is expected to be on stream a year later.

At the luncheon Mr Hatch said that Strasbourg had been chosen for the site as it was ideally situated to service the whole Western European market. It was centrally located with respect to the rubber-consuming areas, he added, was on the Rhine River to facilitate transportation, and on the route of the crude oil pipeline from the Mediterranean to refineries which would be located in the area.

French Personnel

Operation of the Strasbourg facilities would be directed by Polymer Corporation (SAF) with technical advice provided by Polymer, Sarnia, Mr Hatch stated. Certain key Sarnia staff would be required during construction and early operation phase, he indicated; however, they would be replaced as quickly as possible with French personnel to the maximum extent possible. It was expected that the plant would employ 200.

In commenting further on the decision to construct a plant in Europe, Mr Hatch stressed the importance of the area to the future growth of the company. At present approximately 50% of all rubber exported by Polymer Corporation from its Canadian plant was shipped to the Western European area. The establishment of production facilities in that area, he said, would enable the company to strengthen its position as a major supplier of synthetic rubber and to offer improved service to its many customers through reduced delivery times.

While initially the plant would produce a range of specialty rubbers and latices for the rubber and allied industries, Mr Hatch pointed out that ample provision had been made for expansion of the facilities to keep pace with the rapidly expanding world markets for synthetic rubbers of all types.

Finns Buy British for Russians

Telegraph Construction and Maintenance Co. Ltd. has received a contract from Wartsila-Koncernen A/B, Sandvikens Skeppsdocka, Helsinki, Finland, for all the cable handling equipment for two new cableships they are building for the USSR.

The order, which is said to be the largest ever made for this type of equipment, was secured in the face of keen competition at home and abroad. The vessels are of 7,000 tons displacement and capable of laying and repairing submarine cable systems including all types of submerged repeaters.

Plastics Materials Imports Increase by 70%

Imports of plastics materials during 1960 were 93,321 tons — an increase of 70% over the 1959 figures.

Plastics materials exports in 1960 at 171,173 tons were 8.8% above the 1959 level.

Full figures: page 189

Dunlop Chemical Sales Reorganization

THE sales force of Dunlop Chemical Products Division has been divided into two sections, one dealing with adhesives and compounds, and the other with polymers; this is in order, the company says, that increased business may be handled.

The adhesive and compound side is responsible for the sale of the range of Dunlop adhesives, latex compounds for the dipping, moulding and casting industries, carpet backing compounds for tufted and conventional carpets, and compound rubber.

The polymer section is responsible for the sales of Polimul pva and acrylate emulsion used in the paint, paper, textile, leather and adhesive industries and for Dunlop Politone and Gentac latices.

The new sales system replaces the old system of sales control by areas, although supply depots are being retained in Glasgow, Selford and Wembley. New sales appointments are: H. J. Northeast (formerly sales manager) — general sales manager; F. G. Delahoy (formerly assistant sales manager) — sales manager, adhesives and compounds; and J. D. Banks (formerly technical salesman — North) — sales manager, polymers.

Bid for Xylonite

The Distillers Co. Ltd. has made an offer worth £12.7m. for the Preference and Ordinary capital of British Xylonite, one of the principal UK plastic fabricators. Ordinary holders will be offered five Distillers 10s. ordinary for every two £1 units. The board has recommended acceptance of the offer.

Two other companies were 'take-over news' this week. The directors of British Industrial Plastics have decided to accept the £19m. Turner and Newall bid (*RJIP*, January 28, 124). The Dowty Group has made an offer worth over £2m. for the ordinary stock of Boulton Paul Aircraft.

See Stock Market Review, page 193

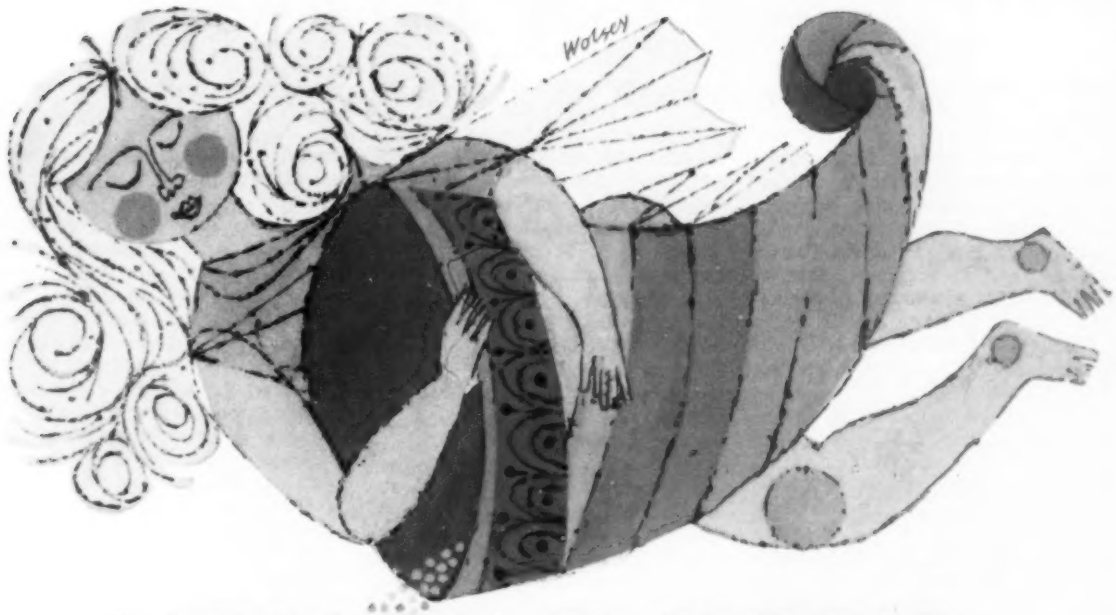
Tyre Import Duties

The Treasury has announced that it has made the Import Duties (General) (No. 1) Order, 1961, which removes the import duty on certain scrap rubber tyres.

The Order came into operation on February 1 and has been published as Statutory Instruments 1961, No. 128.

Erinoid Sells Interest

Erinoid Ltd. has sold its trade investment, consisting of its interest in Nelsons Acetate and Nelsons Lancaster Estate for £450.333, against a value of £100,000 in the last balance sheet. The purchasers are James Nelson and Hercules Powder Company, who were Erinoid's partners in these companies.



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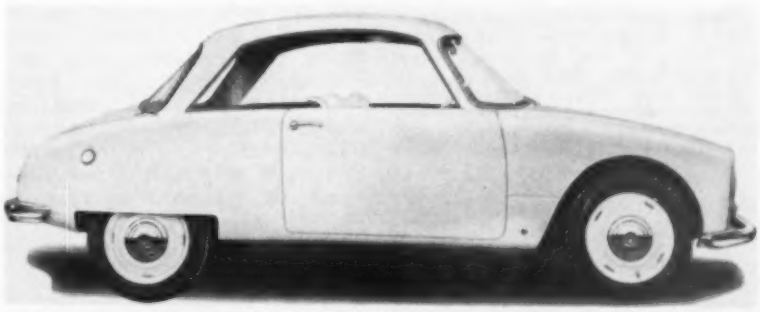

An improved reinforced plastics body is being produced for this Citroen 'Bijou' by the Crowthorne firm C. F. Taylor (Plastics) Ltd. The car is being made in the UK and is the first to differ radically from the models produced by the French parent company. Its air-cooled engine and glass fibre body make it a 'no garage' car

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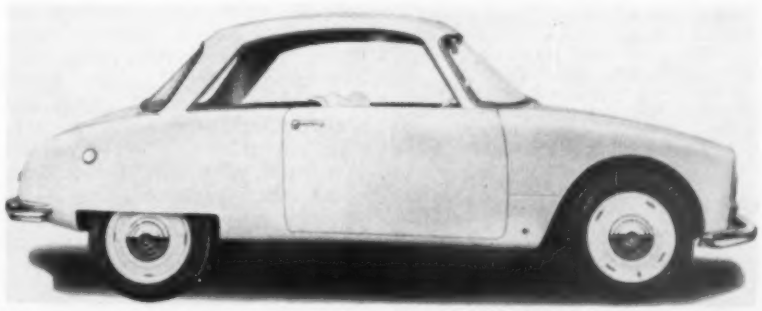
UK exports of tyres during 1960 were nearly 9% up at just under £28m., according to the Tyre Manufacturers' Conference. This figure covers direct exports only; it does not include tyres fitted to exported vehicles and equipment.



An improved reinforced plastics body is being produced for this Citroen 'Bijou' by the Crowthorne firm C. F. Taylor (Plastics) Ltd. The car is being made in the UK and is the first to differ radically from the models produced by the French parent company. Its air-cooled engine and glass fibre body make it a 'no garage' car

Polymers Out In Space

By N. H. LANGTON, Ph.D., M.Sc., F.B.I.S., Council Member of the British Interplanetary Society, National College of Rubber Technology.

In 1962 it is estimated that the market in USA for solid polymer rocket propellants will be worth $250m. In this, the first of two articles, Dr Langton deals with recent important developments in this field.

IN the two years which have elapsed since the publication of two articles[1,2] by N. H. Langton and S. N. Angrove, enormous progress has been made in the technology associated with Astronautics, and there is much more information available about the actual and potential uses of plastics, some of which is discussed in this article. Plastics, because of their low densities compared with metals, their ready processability and thermal properties, are ideally suited for certain applications in rockets and satellites[3]. Laminated plastics have been used successfully in rockets and can withstand temperatures up to 2,500°C. for short periods of time. Metals under the same conditions would be much inferior. Table 1 indicates some of the present and future uses of plastic materials in Astronautics. This table is not comprehensive, but is intended to give some idea of the diversity of the many applications in this increasingly expanding field.

TABLE 1

Present uses: Seals, gaskets, tank and pipe liners, expellent bags, electrical and thermal insulation, pneumatic control diaphragms, adhesives, protective clothing, space suits, balloons, rocket fuels, fuel binders, rocket cases, blast tubes, rocket nozzles, pressure vessels, guide vanes, fins, nose cones, re-entry vehicles, thermal shields, printed circuits, rupture discs, thermal protection of solar batteries, infrared filters, radomes, polarized gratings, and artificial dielectrics.

Future uses: Satellite structures, extra-terrestrial buildings, satellite observatory mirrors, meteorite shields, thermal insulation of space cabins, orbit-to-orbit space vehicles, space suits, etc.

The Rocket Motor

There are two main types of rocket motor, those using liquid propellants and those using solid propellants. Polymers are used in the latter type, in fact this is probably the major use of polymers in space flight at the present time. The differences between these two types of rocket have been dealt with in detail in a previous article[2], and will not be described further here. We are mainly interested in composite solid propellants, which are mixtures of a finely ground oxidizer in a matrix of plastic, resinous or elastomeric material. The matrix provides the fuel for the combustion process, whilst the oxidizer provides the oxygen, without which the fuel would not burn in the vacuum of space. Propellants can be divided into subgroups according to the oxidizer used. The compositions of two representative groups is given in Table 2. Composite propellants can also be characterized by their physical properties. If a plastic binder, such as polystyrene is used, the resulting grain has a hard structure, and is either cast in moulds or extruded to shape. If an elastomeric binder is used, the grain is more flexible, and such grains may be bonded directly to the metal or plastic rocket case. The use of the word 'grain' should be noted, as this has a special and somewhat misleading connotation in rocket technology. The word refers to a single mass of solid propellant, either cast or extruded in one piece, or composed of cemented or compressed pieces. The grain shape refers to the cross sectional appearance of the grain. This is invariably basically cylindrical, with a central bore which may also be cylindrical, or star shaped, cruciform, multiperforated or more complex. Since the burning takes place on the inner surface of the grain, control of thrust is obtained by the design of the grain shape.

TABLE 2

TYPICAL COMPOSITE SOLID PROPELLANT COMPOSITIONS[8]

Type	Composition	%
Ammonium perchlorate	Ammonium perchlorate	75
	Resin binder	20
	Additives	5
Ammonium nitrate	Ammonium nitrate	80
	Elastomer binder	18
	Additives	2

The exact formulation of solid fuels is generally not published, and they are known mostly by names which associate them with the company which makes them. For example, 'Aeroplex' propellants are fairly rigid compositions utilizing resinous or plastic binders, 'Thiokol' has restricted its binders mainly to polysulphide rubbers, 'Arcite' propellants use, among others, vinyl polymers for binders, and the 'Phillips Petroleum Co.' is developing the use of synthetic rubbers.

High Polymer Propellants

The performance of a rocket is governed largely by the efficiency and design of the propellant system. This consists of the fuel, the combustion chamber and the jets out of which the products of combustion are ejected. The optimum design of the combustion chamber and the jets is a matter of engineering and does not concern us here, except to note the use of transparent plastics for the building of apparatus for research into gas dynamics. The use of plastics in the construction of nozzles has been described by Wilson[4], Gilchrist[5] and Nodler[6]. The main question of interest is the use of high polymers as rocket fuels. Assuming then the best design of combustion chamber and jets, the performance of the rocket depends upon the types of fuel burnt in the rocket motor.

At the end of the last war, solid propellant rockets were very inefficient compared with the liquid propellant type such as the V-2. The early fuels were adapted from the explosives industry, and consisted of some common explosive bound with a tarry material. A major advance was the introduction of a rubber fuel, bonded into a thin walled, high strength motor case. Many other polymers have been used, such as the sulphur and butyl rubbers, polyurethanes, and acrylates. During recent years, almost all solid fuel rockets have consisted of a

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polymerizable hydrocarbon binder and an oxidizing material, such as ammonium perchlorate or ammonium nitrate.

The object of burning the fuel is to obtain the maximum thrust for each unit mass of fuel burnt. This thrust is equal to the momentum of the high speed particles ejected from the jet orifice. A consideration of the basic equations indicates why high polymers are so suitable as rocket fuels. The velocity v of the ejected particles in ft./sec. is given by the formula

$$\left[\frac{2\gamma}{(\gamma-1)} \cdot \frac{G\theta_0}{M} \cdot g\left(1-\left(\frac{p_s}{p_0}\right)^{\frac{(\gamma-1)}{\gamma}}\right)\right]^{\frac{1}{2}}$$

where p_s and p_0 are the pressures at the nozzle exit and in the combustion chamber respectively. The combustion chamber temperature is given by Θ_0 in °K, G is the universal gas constant, in ft.lb./lb.mol, γ and M are the mean values, respectively, of the specific heat ratio and the molecular weight of the exhaust gases. This equation does not take into account losses due to shock and friction, so that the actual velocity of the exhaust gases will be about 5% less than that predicted by the equation. This equation shows that for a high velocity of ejection, Θ_0 and p_0 should be as large as possible, and M as small as possible. Since Θ_0, p_s and γ are dependent, it is possible to modify the above equation to give the usual parameter quoted for fuels, the specific impulse I_{sp}, which is the impulse produced by burning unit mass of fuel. We then obtain, where K is a constant,

$$I_{sp} = K \cdot \left(\frac{C_p \cdot \theta_0 - C_p \cdot \theta_e}{M}\right)$$

where C_p is the specific heat of the combustion gases at constant pressure, and Θ_e is the exhaust gas temperature at the nozzle exit. Thus $C_p\Theta_0$ and $C_p\Theta_e$ are the enthalpies of the combustion gases in the chamber and at the nozzle exit respectively. Therefore the main requirements of a rocket fuel are that it should give out a high energy on burning, so that both Θ_0 and p_0 are large, and that the combustion products should have a low molecular weight. These conditions are fulfilled admirably by most high polymers. In fact A. J. Zaehringer, president of the American Rocket Co., states, 'probably the greatest advance yet made in the entire field of solid propellant technology came with the introduction of modern resins, plastics and organic polymers as fuel-binders for high yield oxidants.'[7]

Propellant Properties

One of the most important properties of the propellant is its heat of combustion, which must be as high as possible. Little information is available about the heats of combustion of polymer-oxidizer combinations, but it can be seen from Table 3 that the heats of combustion of some polymers alone compare favourably with other materials, and are exceeded only by the Boron compounds, which are not now favoured as fuel constituents because of their toxicity. Since high polymers consist mainly of carbon and hydrogen, the combustion products are mainly low molecular weight gases when a suitable oxidizer is used, and hence the requirement for a low value of M is fulfilled. Thus high polymers will serve ideally not only as fuel-binders, but also as fuels in their own right. The ideal fuel should have a high percentage of hydrogen, a low percentage of carbon, some oxygen, nitrogen which can be oxidized to diatomic nitrogen, and no phosphorous or sulphur. It should have a specific gravity more than unity and be easily polymerized. The pot life should be at least two hours, the cure time should be under 24 hours and there should be little shrinkage on cure. The material must not give off volatiles and must not react with the oxidizer. Its tensile strength should be higher than 1,000psi and the compressive strength more than 5,000psi. It should be moisture resistant and physically stable at high temperatures, must have a low ignition temperature and burn smoothly. It should be cheap and easily processed, being capable of extruding or casting. It is possible, by correct compounding, to produce a high polymer fuel which fits most of these conditions reasonably well.

TABLE 3
HEATS OF COMBUSTION

Material	Heat of combustion (BThU/lb. of fuel)
Asphalt	17,100
Boron	25,000
Lithium hydride	19,500
Natural rubber	19,380
Rubber, Buna S	18,713
Polythene	19,980
Polyisobutylene	20,160
Polystyrene	17,892
Paraffin	18,500
Sulphur	3,960

There is no doubt that the solid fuel rocket, because of its relative cheapness and reliability, will always be required as a large booster for assisted take-off, for missiles, for the upper stages of large multistage rockets and as retro-rockets for re-entry. The recent developments of the liquid fuel rockets, in particular the successful firing of liquid hydrogen-liquid oxygen rocket motors, and also the successful static tests of nuclear powered motors, tend rather to overshadow the more modest solid fuel motor. Two recent developments, however, have put the solid fuel motor back into the picture as a possible competitor in the high performance field. These are, firstly, the incorporation of fluorine into the

The English Electric Thunderbird ground-to-air guided missile on its launcher

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fuel, and secondly, the idea of segmented motors.

Fluorine Compounds

Most authorities, such as Farber,[8] from whose paper most of the following information was obtained, now believe that the addition of the fluorine molecule to the solid propellant offers the best prospect of a major increase in their performance. Allied Chemicals of America has announced an extension to its advanced propellants research programme of $1.4m. to study this problem.

The idea stems to some extent from early work to improve the solid fuel's performance by the addition of a light metal, such as aluminium in a finely powdered form, to the mixture of polymerizable hydrocarbon fuel-binder and oxidizing salt. The increase in performance is largely due to the higher energy per unit weight resulting from the combustion of the aluminium to its oxide. This extra energy heats the products of combustion to a higher temperature than that obtained from the high polymer and oxidizer alone.

Experiments have shown that although the addition of aluminium gives an increase in performance at low altitudes, there is no substantial increase at the higher altitudes. Thus the search for propellant ingredients that will yield high heats of reaction with low molecular weight combustion gases containing a minimum amount of solid or liquid particles is continuing. The hydrocarbon portion of the propellant consists mainly of hydrogen, carbon with smaller amounts of oxygen and nitrogen. The binder and the light metal additive must obtain oxygen from the oxidizing salt. The nitrogen present in the compound provides a gas of relatively high molecular weight and does not contribute much to the combustion energy. The high polymer fuel and oxidizer on combustion gives an average energy of roughly 2kcal/g. The light metal oxides contribute an extra 3 to 4kcal/g., and so it is desirable to have as much metal as possible in the formulation.

Work on Fluorocarbons

It is necessary, however, for the light metal to yield gaseous products on combustion, and the search for light metal compounds with high available energies leads to the fluorine atom. There are two major advantages in the use of metal fluorides. Firstly, unlike the oxides, which have high vapourization temperatures and are solids or liquids at the combustion temperature, they form stable gases on combustion. Secondly, they form extremely energetic exhaust products. Another advantage is that the fluorine acts both as an oxidizer and a fuel, and the relative percentage of the low energy carbon is reduced. Recent work on these fluorine materials has produced several castable fluorohydrocarbons having densities nearly twice those of the conventional polymers. These materials have excellent physical properties. They have satisfactory tensile and compressive strengths, and bond readily to metals, plastics, and glass. The monomers are clear, dense liquids which polymerize readily upon the addition of catalysts. These fluorine polymers have an empirical formula of the type $-CH_xF_yO_z$. Although fluorocarbon research is still in its infancy, these new polymers promise to provide superior solid propellants for future spacecraft and missiles.

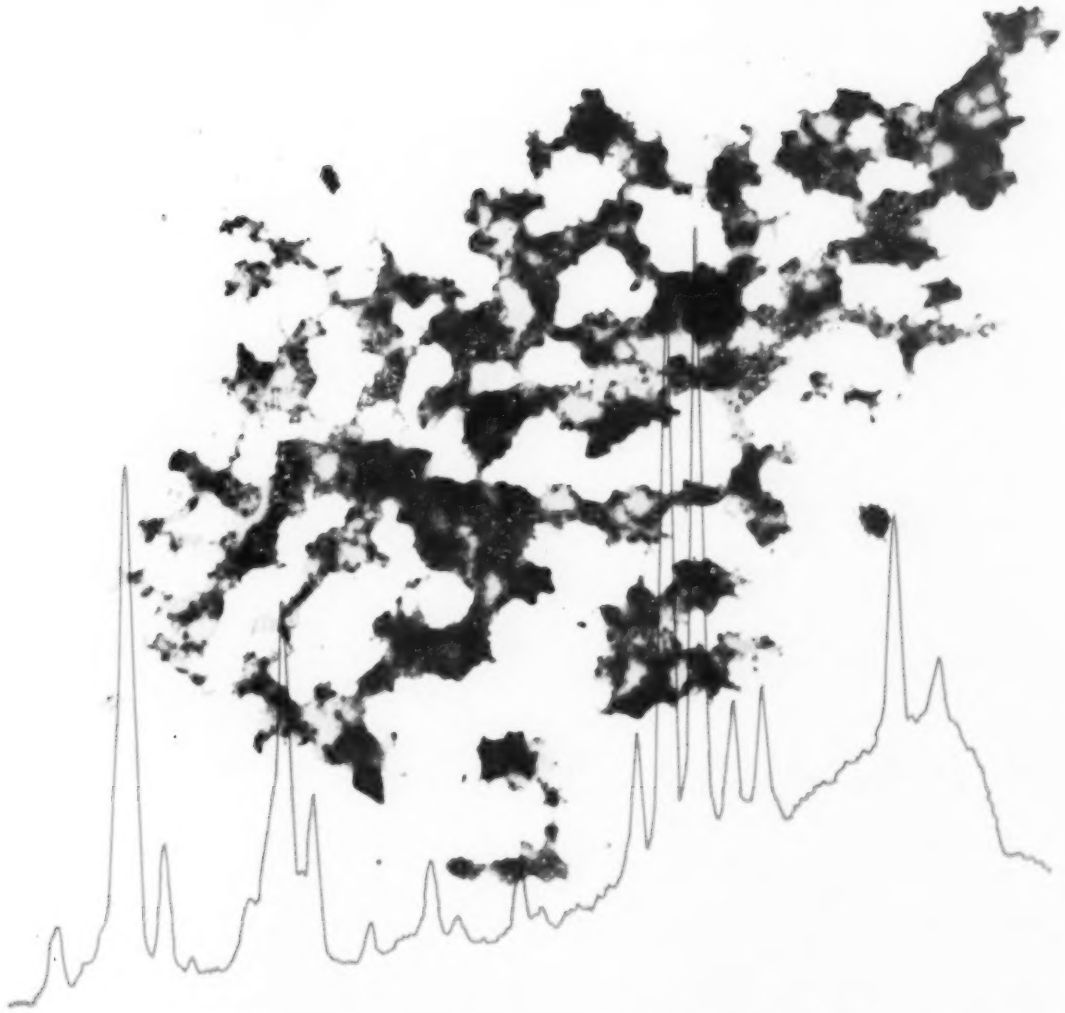
Grain Casting

One of the main difficulties in the use of solid propellants is that of casting the large size grains required for big rockets. A single grain of several hundred tons may be required, and the presence of a single crack in this renders it useless, as it would explode on combustion. There is also the problem of how to dispose of the unwanted grain in safety. The segmentation of the grain means simply that a large motor is built up from a number of smaller grains, cast so that they fit into each other to form one large grain, or so that each small grain forms a stage of the multistage solid rocket. There are a number of obvious advantages in this procedure. Firstly, it is only necessary to cast relatively small grains each time, the segment size suggested being about 10ft. in diameter and 10ft. long, and weighing about 40 tons, and of a conical shape. Secondly, the segments can be stored and inspected easily, and a faulty segment can be rejected and replaced without sacrificing the whole rocket motor. The author of this idea, A. C. Keathley,[10] of the United Technology Corporation, California, states that this concept of segmentation solves many of the problems hitherto associated with big solid rockets, and gives the solid propellant sound grounds for competing with liquids in space boosters. Details of the scheme can be found in the original paper.

It appears therefore, that the use of high polymers as rocket propellants is becoming of increasing importance. Synthetic rubbers are already well established in this field, and other polymers are finding increasing use. It is estimated that in America by 1962 the solid fuel industry will be doing business to the extent of $250m. per year. At the present time, between 50,000 and 100,000 people are involved in various aspects of solid fuel research, development and fabrication. Full details of the technology, development, properties and economics of the use of polymers in rockets are given by Zaehringer,[7] 1958, whilst for details of work after this the original papers must be consulted, but, no doubt for security reasons, recent information is rather meagre.

References will be quoted next week in a concluding article, in which Dr Langton will show how polymers are playing an important part in tackling re-entry problems.

Guided missile radomes under construction. These are made from knitted glass fibre shapes impregnated with Bakelite polyester resin



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Technical Service at ISR

WIDE RANGE OF PROBLEMS TACKLED BY NEW LABORATORY

THE International Synthetic Rubber Co. Ltd. has recently completed a new technical service laboratory at its £6m. Hythe plant. Pictures of the new laboratory are printed here. It contains a full range of compounding, processing, testing and other equipment, which provides the technical background for the company's grades of SBR, and examines and develops new end uses for them.

The information obtained through investigations carried out by the Technical Service Department is promulgated either in information sheets where only the pertinent data is reported, or in technical reports where the background leading to the conclusions is described in fuller detail. In both these types of publication general topics such as mastication, oxidation and hot tear strength are discussed and, on occasions, descriptions are given of special manufacturing processes involving Intol.

Many of these reports have already been published (with several editions). The company says that research work has now been completed on a further 30 topics and these will be published in due course. (In common with other companies, some of ISR's work is confidential by request, and then, of course, there is no publication of the results.)

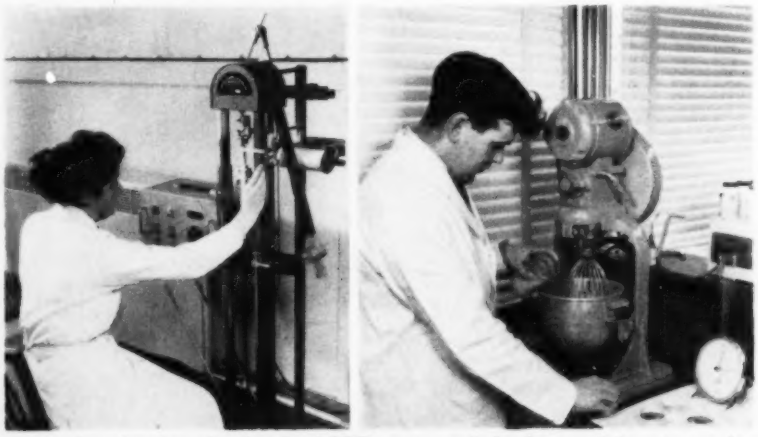
Standard Specifications

A further activity of the company's technical service concerns the investigation of both UK and foreign standard specifications for rubber goods. In many cases the company claims it has been possible to show that the established quality standard can be met or even improved upon by the replacement of natural rubber, either wholly or in part, by SBR.

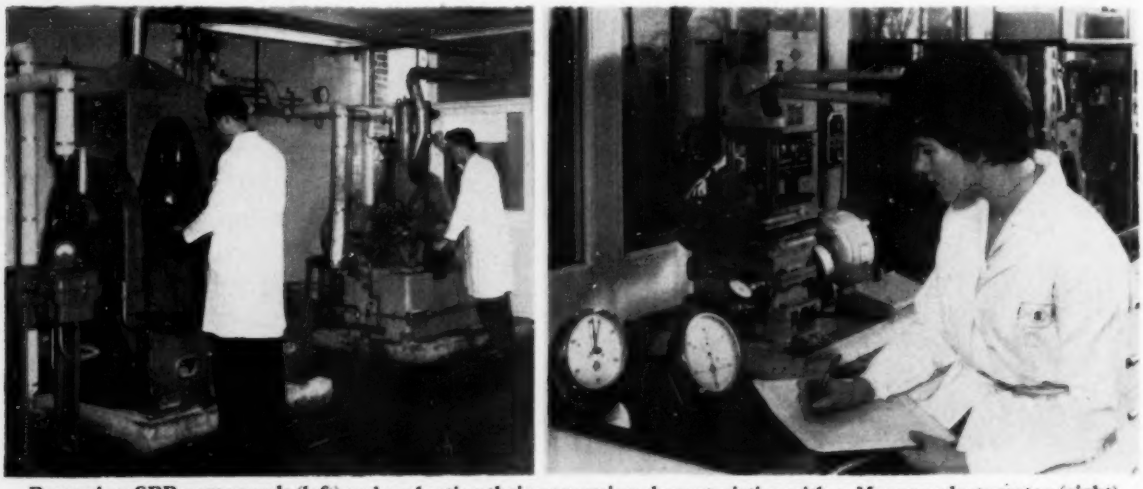
Among the subjects investigated, which will be the subject of future reports, are:

- DV soling compounds, including sponge slipper soles.
- Solubility of Intol polymers in aromatic solvents.
- The bonding of weather stripping compounds.
- Further information on mastication.
- Rail chair pad formulations to British Railways specification.
- The application of Intol latex 62/A to various latex processes.
- Gas tubing.
- Wellington boot soling compounds.
- Processing of semi-blown resin.
- Impregnation of paper for floor tile underlay.
- SBR in semi-ebonite compounds.
- Mixing techniques for light coloured reinforcing materials.
- White reinforcing fillers in SBR.
- Coloured bicycle tyres.
- High-tensile low-hardness formulations.
- General purpose water and air hose to British Standard 924.
- Furniture webbing.
- Laboratory tubing.
- Hydraulic brake cup formulations.
- Hard rubber plugs.

The manager of ISR's technical service department is R. Hickson.



Physical evaluation of vulcanized SBR compounds in the new laboratory using a Hounsfield tensometer (left). Right: Laboratory scale SBR latex production



Preparing SBR compounds (left) and evaluating their processing characteristics with a Mooney plastometer (right)

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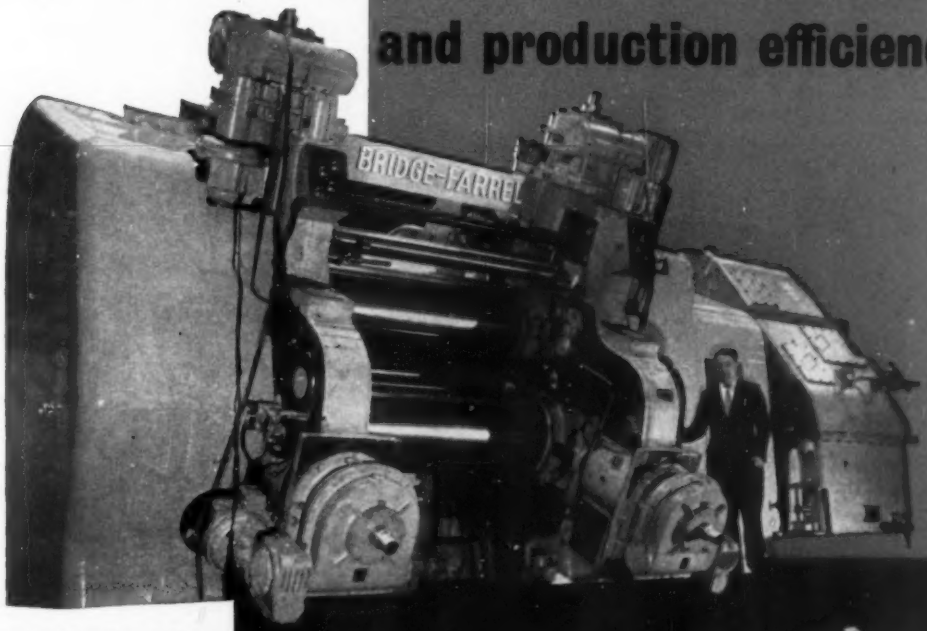

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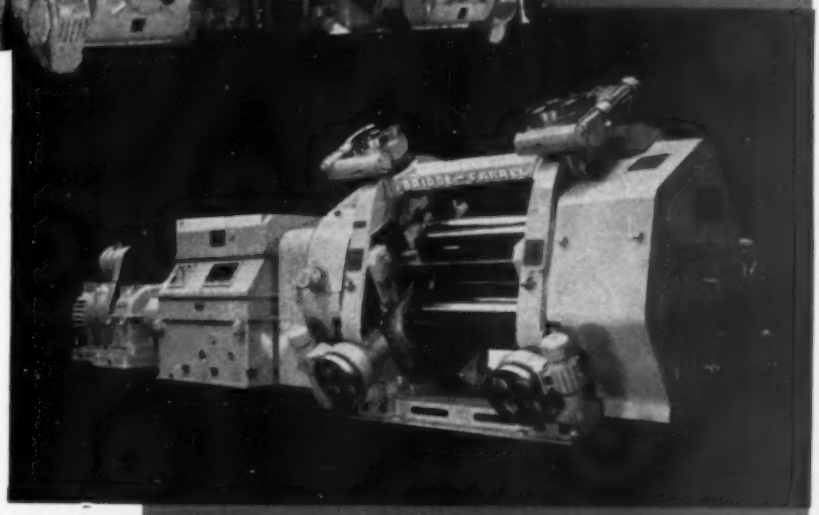

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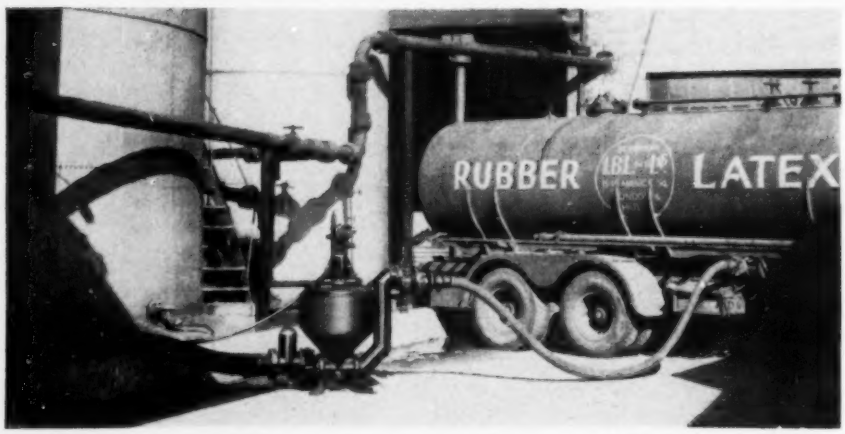

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Plastics Invade the Home

THE FURNITURE EXHIBITION 1961

NO more than a brief visit to the furniture exhibition which opened at Earls Court on February 1 is needed before it is realized that here is yet another field where the impact of recent developments in plastics and rubbers is having an ever-increasing effect. Natural rubber latex foam has for some years held an important place in the furniture industry for the manufacture of cushions and mattresses. Latices containing varying proportions of synthetic rubber are being increasingly employed and polyether foams are also being widely used. As reported in *RJIP* January 28 the British Cellular Rubber and Plastics Manufacturers' Association have produced a specification laying down a standard for polyether foams for seating applications, which is an indication that the future of this material in furniture is bright.

Glass Reinforced Structures

Glass reinforced plastics as structural materials have also found a place in this field, their applicability being to some degree aided by modern design trends which make them particularly suitable for the production of one piece moulded chair bodies. Thermosetting laminates are already firmly established as easily cleaned, chemically resistant and decorative surfaces and these are being increasingly used in furniture destined for all rooms of the home.

Other applications where plastics are finding increasing uses include PVC upholstery, waterproof mattress covers for little children, and floor and wall coverings.

Dunlopillo is one of the best-known names in the foam rubber and bedding industries and their stand has examples of the latest range of mattresses, pillows and divans, the newest addition being the Comfort-Plus divan designed to answer the needs of people with back trouble, combining firm support with maximum comfort. Also displayed is the full range of Vynolay floor coverings.

Comforts for the Troops

Among the products exhibited by Vitafoam Ltd., one of Europe's largest manufacturers of latex foam, is one of the new army mattresses. This is part of a contract for 67,000 mattresses worth over £400,000 recently acquired by Vitafoam. Other products include cushioning and seating for furniture and car upholstery, rubber underlay for carpets and Vitaweb solid rubber webbing. Vitesta Ltd. is a new subsidiary recently formed by Vitafoam to specialize in the use of glass fibre reinforced furniture. Products include dining and easy chairs, illustrated on this page, and a glass fibre bed claimed to be the first of its kind ever offered the British public.

Aeropreen Ltd. have invited designers in Great Britain and six European countries to submit chairs of advanced design, upholstered with Aeropreen polyether foam, for exhibition. These chairs and the range of polyether foams together with specimens of the company's cutting, doming and fabricating services, form the basis of the exhibit.

Furniture units manufactured in whole, or in part, from Weyroc and Weydec compressed boards are to be seen on the stand of The Airscrew Co. and Jicwood Ltd., showing the use of these synthetic resin bonded materials in the production of contemporary furniture.

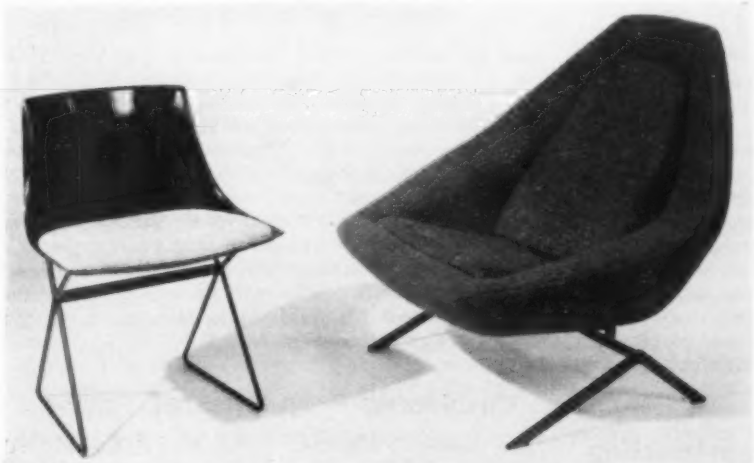
Commercial Plastics Ltd. are showing for the first time a material known as Nappatex, available in Empire calf and suedette grains, hard wearing and stain resistant and designed for all types of upholstered furniture. Fablon Ltd., a member of the Commercial Plastics group, are exhibiting Fablonite, a decorative melamine laminate which can be supplied in many contemporary designs.

Scandinavian Trends

The products of Formica Ltd. need no introduction and the stand is designed to show the latest colours added to the standard range including a new woodgrain effect 'teak,' following current Scandinavian trends in design, and the 'mosiac' colours. These additions bring the number of colour/patterns in the range to 65.

Another firm making claims to lead the field is the Marley Tile Co. Ltd., who claim that Marley foam is the only *moulded* polyether being produced in this country for the furniture industry. This is produced under American licence and is being moulded to the specific requirements of the individual furniture manufacturers in an ever increasing range of shapes and sizes.

Storey Brothers and Co. Ltd., manufacturers of Con-Tact and other vinyl products, make their first appearance at the furniture show and are showing two new types of vinyl-coated fabric. These are on a knitted fabric giving a softer extensible material and on an open mesh fabric backing allowing back-to-back welding. Besides the applications of rubber and plastics described here, there are, of course, many less obvious uses including glues and surface finishes — scarcely a firm at the exhibition is not using polymers in some shape or form.



These new glass fibre chairs are from Vitesta Ltd., Vitafoam's new subsidiary. The easy chair is of double shell cavity construction, with latex foam cushioning and Vitaweb rubber strapping in both seat and back. The dining chair has a thin latex foam cushion

VIEWS and REVIEWS

THERE are many difficult problems in communicating scientific ideas to audiences of widely differing levels of scientific training. Some of them were dealt with in an address by A. B. Oldfield Davies to one of the British Association meetings last year.

Mr Davies is the BBC Controller for Wales and his address on Science Broadcasting was published in the *Advancement of Science* for November 1960.

Publicizing Polymers

One of the points that Mr Davies deals with is the publicizing of scientific achievements. The achievements of the polymer industry could, I think, be given a wider publicity; and some of Mr Davies's ideas are interesting here.

'It is not so much the formal acquiring by non-scientists of a body of scientific knowledge as developing in them an attitude of positive, sympathetic, active and friendly interest in scientific matters, a respect for scientific method and achievement, and an awareness of the significance of scientific advances. Not so much straightforward instruction as an acceptance of the fact that scientific knowledge is related to social needs and conditions.'

Quoting from an assessment made some years ago by Professor Andrade: 'If he (the listener) can at the end retain a general impression, even if vague, of the kind of thing that is going on at one point of the scientific front and of the kind of spirit that animates the man of science, then I think that the talk has been successful. In particular, if the listener comes to think of science as something living and growing and not closed and finally certain; if he learns what kind of a "why" the scientist is prepared to answer; if he notes the absence of arrogance that characterizes people who know something but know that there is an infinity they do not know and contrasts it with the glib certainty and sweeping assertions of those who deal with political questions where all is uncertain — well, in that case science broadcasting is well worth while.'

I think it would do our industry good if it could achieve publicity of this kind by all possible means: print, film, broadcasting, lecture room. We have an engaging story to tell, and just because we are an expanding, progressive industry we need to tell it.

Mr Davies hits on one of the difficulties. 'It often happens that brilliant young scientists are generally too immersed in their researches to be attracted to a whole-time job of mass-communication.' '. . . a scientist who masters the art of communicating his thoughts to the general public, who goes down to the market place as it were . . . runs the risk of being dismissed as a popularizer or labelled glib and begins to lose his standing and authority as a scientist.'

Three-dimensional Graph Construction

Technologists will be interested in two useful articles in that enterprizing booklet *The Vanderbilt News*, Nos. 2 and 4 of Vol. 26, which are the issues for March-April and August 1960. In the earlier one, there is a paper by John Sigmann entitled 'Curing System Design by Planned Experiment' in which he records how they took a typical SBR curing system and varied the proportions of the three basic curing ingredients, sulphur and two accelerators. These three variables form the boundaries of a cube within which the physical test results were recorded and so by slicing along a plane on which all points have the same value, for say the modulus at 300% elongation, it is possible to see at once all the combinations of proportions of those three ingredients which yield rubbers with that modulus figure.

Of course, the technique is by no means new, but it is not nearly so widely employed as its apparent advantages would suggest. Sigmann's paper is, of course, concerned with the Vanderbilt proprietary accelerators 'Amax' and 'Cumate' but the numerous illustrations of three-dimensional graphs are of intrinsic interest in themselves as a laboratory technique.

The experimental procedure was based on using four different proportions of each of the three variables, thus making a total of 64 samples, but to save time only one out of two was actually made. An experimental design table clearly shows the scheme.

Four of the cube diagrams show the proportions of the three curing ingredients needed at a curing time of 15 minutes at 320°F. to yield moduli of 1,300, 1,100, 900, and 700 psi. The sliced, exposed planes or 'response surfaces' are very clearly indicated. Four similar cubes show the response surfaces for 5, 8, 12, and 15 minutes cure at 320°F. to develop 800 psi modulus at 300% elongation. There is also an illustration of how the technique can be used for the three-dimensional presentation of scorch data.

In the August number, the same techniques are applied to a planned experiment on the curing of a tread rubber.

Cross-linked Polythene

Also in the March-April 1960 issue of *The Vanderbilt News* is a paper on the peroxide cross-linking of polythene using 'Varox.' A table presents the electrical properties of LD polythene, cross-linked and containing a range of carbon black, and also the effect on those properties of single- and double-mixing. Graphs show the relationships between state of cure (as measured by the Williams parallel-plate plasticity test) and tensile strength, elongation, abrasion, and brittle point.

'Varox' can also be used to make a blown sponge from cross-linked polythene. A formula, procedures for making open- and closed-cell types, and photographs of the products are given.

Cushioning Properties of Foams

The Vanderbilt News No. 5, Vol. 26, for October 1960 has an article on foam which begins: 'Squeeze a piece of Foam Rubber and "comfort" is your immediate reaction. Apply a test of this type under carefully controlled conditions and some interesting facts reveal themselves.

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **F. C. JENNINGS**

'The Vanderbilt laboratory uses the Instron Tester for studying compression modulus and hysteresis, properties which relate to comfort characteristics of foam cushioning materials.' The samples tested were little, squat cylinders, 1in. high and 1.5in. in diameter.

There were four kinds of latex foam made, respectively, from natural latex, SBR latex, and two different mixtures of the two. These were compared with four samples of polyurethane foam made up from three commercial samples, selected because they 'matched closely in RMA compression' and were therefore presumed 'to provide a reasonable comparison' with the latex foam.

The results obtained showed the 'superior reserve cushioning power of latex foam' compared with polyurethane foam. Or, in more detail: 'Comparison of Instron charts indicated that in the low deflection range, latex and polyurethane foams appear to have similar cushioning properties. As deflection increased beyond the 25% level accepted as standard in latex foam evaluation, significant differences in the two types of materials became evident. At 50% deflection, latex foams offered decided advantages. At 65% deflection which is quite possible when soft, low density structures are used for cushioning, differences became even more pronounced. After reaching peak load at all deflections studied, downward drift was more gradual and levelling off more rapid with the latex foams.

'Differences in hysteresis loops were also quite pronounced, indicating the superior "reserve cushioning power" of latex foams. At 65% deflection, for example, the latex loading and unloading curves approach straight lines and nearly coincide. The polyurethane curve shows an initial rapid rise with a plateau effect between 25 and 50% deflection, then a relatively slight rise as deflection increases. The broad loop formed by the return path indicates resiliency of a relatively low order for polyurethane.'

Invalid Comparisons

The general trend of these results could be anticipated by a foam rubber technologist, but there would be much fun if he and his colleagues tried to say what they signified. One of the first questions would be: 'Is it fair to make this comparison?' Can one legitimately compare the properties of cellular rubbers which differ so widely in density? (The latex foam density was 2½ to 4 times that of the polyurethane foams with which they were being compared.)

They are said to be comparable because they were 'closely matched in RMA compression.' This is not quite, be it noted, an accurate statement: in fact, only one of the four pairs is closely matched, the others differ by 14, 15, and 25% respectively.

But, even if they had been identical in RMA compression figures, a very large body of technical opinion, especially outside the USA, would argue that this would not justify a comparison at other than the RMA deflection of 25% — which is actually what the Vanderbilt figures themselves reveal. If a British foam rubber technologist were selecting samples on a hardness basis (which is what we in Britain understand by the RMA figure), he would use a figure based on what he regards as the more realistic figure of 40% deflection. He regarded 40% as a more reliable figure for two reasons: 1, because 25% lies close to the inflection point of the load/deflection curve while 40% is well away from it on the straight portion of the curve, and 2, because 40% is nearer to the deflection of a cushion in service.

I conclude therefore that, between the Vanderbilt samples, a valid comparison cannot be made.

Comfort

It must be emphasized too that the conception of 'comfort' is a much more complicated matter — even on physical measurements alone, without considering the psychological factors — than compression modulus and hysteresis. Indeed, in selecting a hysteresis loop favourable to comfort, I would select the opposite type from the one chosen by Vanderbilt. A cushion, especially in a moving vehicle, needs to absorb energy not return it, *i.e.* it must not be unduly resilient, possessing a broad hysteresis loop indicative of 'resiliency of a relatively low order.'

The comfort of cushioning materials cannot yet be measured by laboratory apparatus however carefully the conditions are controlled or however precise the instrument. We have not yet made up our minds what properties we ought to measure. In fact, the best apparatus for measuring comfort is still the one provided for us by Nature. And it should be used to make only valid comparisons such as, I suggest, comfort per penny.

Latex Foam Processing

Pages eight and nine of the October 1960 issue of *The Vanderbilt News* carry some information on the compounding and processing of latex foam based on SBR latex. Interesting points are that deammoniation is not necessary and that the process lends itself readily to 'a continuous compounding and frothing operation using two Oakes machines in series, metering the compounding materials into the first while the second Oakes unit would finish and froth the final compound.

The Colour of Work

According to a recent report in the *Daily Telegraph*, Mr Faber Birren, an adviser on colour to a number of British and American companies, recently spoke in Manchester about the results of a questionnaire organized by the National Industrial Conference Board and answered by 150 companies.

Monotony of colour, or of lighting, can cause accidents because 'the eyes will tire and reach a point when they cannot easily distinguish objects.' Some colours are better than others and can raise productivity, improve quality, and reduce absenteeism. Blue and yellow are tiring, soft grey hues are said to be best for industry, a soft blue-green being especially recommended. 'This colour is the direct complement of the human complexion, so that employees appear to have a warm, attractive appearance, a flattering effect that can be good for morale.'

The study of the relationship between colour and working temperature produced interesting results. 'In high working temperatures, cool colours such as green or blue have been found to improve conditions. If a building is high or chilly, then warm tones of ivory, cream, or peach help to soften the atmosphere.'

CHARLES JENNINGS

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MEN *and* MATTERS

A Review of People and Events

by Peter Richards

ONE rubber firm that is certainly not slow off the mark so far as exports are concerned, is J. H. Fenner and Co. Ltd., the Hull belting manufacturers.

Fenner tells me that in spite of increasing difficulties in exporting — such as the halving of the first quotas for export to South Africa in 1961 and the prohibition of imports of equipment to Israel — it continues to make big increases in its annual turnover overseas, mainly because of its rapidly expanding range of exportable products.

S. B. Hainsworth, chairman of J. H. Fenner and Co. (Overseas) Ltd., recently announced appointments to further this export drive. John Cleator, director and general manager, is now assisted by divisional directors in John Perry for India, Alec Bingley for Africa, John Davies for the 'Seven' and Gerald Munby for the 'Six.' They have lost no time — four of these executives are abroad. Mr Hainsworth himself is now in Africa; his itinerary includes a visit to J. H. Fenner and Co. Africa (Pty.) Ltd., the company's latest overseas subsidiary.

Butyl for Tankers

The Winter issue of the *Esso Magazine* contains an article spotlighting the butyl plant which is to be built at Fawley at a cost of £4.3m. This will be only the second butyl unit in Europe (the other is operated by SOCABU at Port Jerôme in France).

After dealing with butyl in tyres and tank linings the article goes on to give some interesting applications in electrical installation. Here a number of properties are useful, such as heat resistance enabling higher current ratings with consequent reduction in the diameter of the conductor used, and small moisture absorption. Ships' wiring comes to mind — and Esso has not been slow to use its own product. The 36,000 deadweight ton tankers *Esso Durham* and *Esso Portsmouth* are wired with butyl ships' wiring — as will be two big tankers that the company has on order.

Petrochemical Poetry

The same issue of the *Esso Magazine* contains an Oilphabet, with verses by Paul Jennings and drawings by Emett. Here is A:

Alchemists stared at a piece of lead,
'Turn into gold!' they madly said.
Nothing happened for all their toil
So now they use not lead, but oil.

and here is P:

Polyvinylchloride seems
A figment of alchemical dreams.
But no. It's used by you and me
As (e.g.) car-seat PVC.

I was a little disappointed that R was represented by research and not rubber. With great apologies to Mr Jennings and to Esso, I offer the following:

Rubber from oil is often obtained,
By this the planter is rather pained;
But the peace is kept by a lucky trend —
The use in tyres of a two-part blend.

Perhaps some of my readers will take their poetical quills out of their test tubes and have a crack at producing rubbery verses from oil.

Television Connexions

W. M. Chapman-Walker has been appointed a director of Aerialite Ltd. He has been associated with the company as part of its London organization, for a number of years.

Mr Chapman-Walker was the first managing director of Television Wales and the West and is the general manager of the News of the World Organization Ltd. He sits as representative of Aerialite and of Television Wales and the West on the board of Wirevision Ltd.

Aerialite had another — slightly different — connexion with television recently. The company's cable division works at Stalybridge, Cheshire, was chosen for a programme in the ABC series 'Sing Along With Joe.' 300 Aerialite personnel watched the show, which was held in the PVC department of the works.

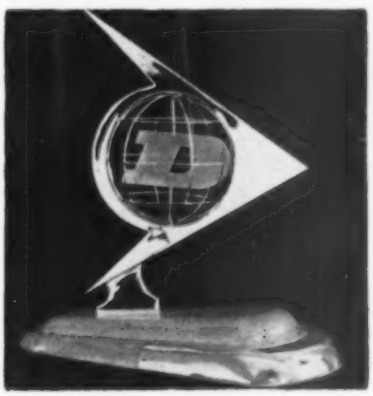
Polyurethane Foam Uppercut

Foam is usually connected with comfort. In one application I came across recently the comfort is double-edged — or double-fisted. A Hyde, Cheshire, manufacturer is making boxing gloves out of Kay Bros. expanded polyurethane.

Plastic foam has many advantages over the old coir hair padding. It does not matt or harden with use, and will generally lengthen the life of the gloves. And canny boxers will no longer be able to work the padding clear of their knuckles so that they can give harder punches than their opponents!

Exceptional Endeavour

Lord Baillieu, President of Dunlop, strongly believes that competitive enterprise has a special contribution to make in raising standards of life, and that, as well as the ability and willingness to work as a team, competitiveness depends on original



thought, judgment, courage, energy and perseverance. He has expressed his belief in concrete form with a trophy which will be awarded within the Dunlop organization to the group, large or small, at home or abroad, which shows exceptional endeavour in promoting and improving the competitiveness of the company.

A brief statement of the qualities involved—vision, courage, energy—has been 'written into' the trophy which is a silver replica of the new Dunlop symbol. Although the trophy will be held for a year, it will only be awarded when the chairman and directors consider that there is a special claim to be recognized.

Goodyear Appointments

Goodyear (GB) has appointed E. G. Smethurst manager of its North-Western sales division, which has its headquarters in Manchester. He replaces E. D. Mackintosh, who has

been transferred to Goodyear's head office at Wolverhampton to handle special sales assignments.

Another appointment in the company is that of P. F. Kavanagh to assistant divisional manager, Scottish division. Mr Kavanagh joined the company in Singapore in 1941. He was general manager of the Goodyear Orient Sales Co. Ltd. at Singapore in 1952, and in 1958 was transferred to Goodyear (India) as sales director.

B. Gledhill has been appointed technical manager of the India Tyre & Rubber Co. Ltd. He joined the tyre industry in 1946 and has held executive positions in tyre plants in South Africa and Canada

British Expert Joins Dow

Raymond C. Mildner, former chief technical officer of the Telegraph Construction and Maintenance Co. Ltd., has joined the plastics department of The Dow Chemical Co., Midland Michigan, as a technical specialist in dielectric insulation for power and communication cables.

Mr Mildner has done much work in high-voltage and tele-communications cable development. He is the author of a dozen publications on cable research and development, and holds 10 UK patents in the field.

North British Rubber Co. has appointed Colin McInnes field sales engineer within the Industrial Products Division. Mr McInnes will handle the field activities of conveyor belting

Appointments in Brief

J. B. Stott, a director of James Stott Ltd., the subsidiary of John Bright and Brothers Ltd., has been appointed to the board of the parent company.

* * *

R. H. Hazlehurst has been appointed Midlands area representative of Lumenated Ceilings Ltd. He has lectured frequently in the Midlands on behalf of the British Lighting Council.

* * *

D. S. Meeks has been promoted from chief draughtsman to plant engineer in charge of Blue Peter Retreads Ltd.'s engineering and maintenance department.

THE LEGAL ANGLE

Liabilities in Tyre Testing

By a Barrister

'A high-speed section of the new road research track at Crowthorne, Berks, has been designed so that the skid-resisting properties of roads and tyres can be investigated at motorway speeds. At the opening, one of the demonstrations given showed the greater resistance to skidding of rubber tyres with hysteresis loss.'— From a recent issue of RJIP.

Testing tyres is a job requiring skill, experience and, sometimes, courage. And one which can be dangerous. What, then, are the liabilities of an employer whose staff are injured as a result of tyre testing or some other dangerous operation, essential to production?

An employer's duty is to provide his men with a safe system of working — which includes proper plant and appliances, adequate supervision in and about his work and a safe place to work in. But this is not an absolute duty. He is only bound to take 'reasonable care' to see that the employee is 'reasonably safe' in and about his work.

'But a driver who is employed to test tyres,' you say, 'obviously takes on work which involves danger. You hope that the tyres you provide him with are safe — but the only way you can be completely sure is by having them tried out under actual motorway conditions. And if something goes wrong, surely he can have no come-back against you?'

There is an old legal maxim that 'volenti non fit injuria' — that a volunteer has no remedy. If, then, the driver takes on a hazardous job with a full knowledge of the risks he is likely to incur — with his eyes wide open — then if something goes wrong, he will have no come-back against you. He not only had knowledge of the risk involved — which, in fact, brought disaster — but expressly or impliedly agreed to accept it.

'But suppose that the road had been negligently built . . . the wheels carelessly fitted . . . the tyre improperly made . . . could the employer still avoid liability?'

If the employee had freely agreed to do the job at his own risk — and, in fact, to free the master from liability for damage caused to him, whether through the negligence of his fellow servants or otherwise — then he will have no remedy. But in most circumstances, the fact that a man agrees to take on dangerous work does not mean that he is freeing his master from his usual duty to take reasonable care for his safety. There are enough perils inherent in the job, without adding extra ones. He may willingly undertake normal perils — for the money or the thrill of it — but this, on its own, does not free the master from his duty to take such care for the man's safety as is consistent with the work he is doing.

It follows that while test drivers may have to take special risks on the new track, so as to reduce risks for future buyers of the tyres they test, the track must be as safely made — and the tyres as well constructed — as reasonable ingenuity and skill can make them. If in spite of reasonable precautions someone suffers injury, the employer will be in the clear. The driver is a volunteer who freely undertook the work. But if the real cause of injury or damage was the employer's negligence, he will undoubtedly be made to pay for it.

Polly Ester Says . . .

'Silicone rubber — dunce's eraser'

Plastics Statistics

DECEMBER EXPORTS AND IMPORTS

PLASTICS materials exports during December 1960 were 14,241 tons — slightly down on the November 1960 figure of 14,934 tons. The figure for December 1959 was 14,106 tons. The value was £3,446,134: £3,667,465 in November 1960 and £3,573,770 in December 1959. These figures are given in the official Trade and Navigation accounts, which show that the biggest quantity was taken by Sweden (1,021 tons) followed by France (865), Australia (693), Hong Kong (634) and the Netherlands (625).

Imports during the month were 8,344 tons valued at £2,496,038, compared with 5,719 tons (£2,051,937) in December 1959. USA was the major supplier with 3,544 tons, followed by Western Germany with 1,592 tons.

Imports for the year 1960 were 93,321 tons (£29,731,694) compared with the 1959 figure of 54,542 tons (£19,809,585).

Exports during 1960 amounted to 171,173 tons (£42,897,215); 1959 exports were 157,334 (£39,979,084).

Details of imports of plastics materials during December 1960:

	Tons	£
Alkyd solid and liquid resins, solutions, emulsions and dispersions	175	36,060
Cellulose plastics:		
Photographic (including cinematograph) film base (except acetate butyrate)	110	152,643
All other	281	202,294
Polyvinyl chloride:		
Polymers and copolymers	2,427	320,095
All other	650	211,036
All other	4,701	1,573,910
Total	8,344	2,496,038

Exports of plastics materials during December 1960:

	Tons	£
Acrylic sheet, rod, tube, film, foil and profile shapes in primary form	679	420,583
Alkyd solid and liquid resins, solutions, emulsions and dispersions	439	96,690
Aminoplastics:		
Solid and liquid resins, including solutions	960	134,523
Moulding and extrusion compounds	780	139,183
Cellulose plastics:		
Moulding and extrusion compounds	258	76,145
Sheet, rod, tube, film (excluding regenerated cellulose), foil and profile shapes in primary form	135	85,733
Phenolics and cresylics:		
Solid and liquid resins (straight and modified)	703	108,461
Other	682	232,932
Polystyrene	1,025	202,438
Polythene (polyethylene) sheet, rod, tube, film, foil and profile shapes in primary form	140	49,146
Polyvinyl chloride:		
Polymers and copolymers	985	133,380
Moulding and extrusion compounds	2,020	397,827
Sheet	575	235,675
Other	78	24,571
All other	4,089	1,042,027
Waste and scrap (including celluloid and film waste and scrap)	693	66,820
Total	14,241	3,446,134

UK exports to countries in the European Economic Community (Common Market) and the European Free Trade Association are shown below.

EXPORTS TO EEC

	Dec. 1959	Dec. 1960
Western Germany	431	417
Netherlands	428	625
Belgium	471	406
France	491	865
Italy	419	504
	2,240	2,817

Exports to Commonwealth countries during the month were 3,793 tons (4,892 in December 1959) and exports to all other foreign countries were 5,314 tons (4,095 tons).

EXPORTS TO EFTA

	Dec. 1959	Dec. 1960
Sweden	803	1,021
Norway	521	373
Denmark	692	588
Switzerland	387	335
Portugal	263	273
Austria	213	238
	2,879	2,828

(Any apparent discrepancies are due to rounding off of figures)

IRI NEWS

PROMINENT SPEAKERS IN RHODESIA

THE Institution of the Rubber Industry's new section in Rhodesia has been addressed by a number of prominent speakers, including Dr S. Reissinger, of Farbenfabriken Bayer, and Dr J. T. Watts, of I.C.I. Blackley.

Dr S. Reissinger addressing the Rhodesian section at Bulawayo

Dr Reissinger presented a paper on 'High Temperatures on Compounding Carbon Black Stocks' while Dr Watts spoke on 'Chemical Additives and Ageing of Rubber.' The section committee reports that these lectures have stimulated great interest in the section.

Glasgow Symposium

Arrangements have been finalized for the joint IRI/Plastics Institute symposium to be held at the Royal College of Science and Technology, Glasgow, on April 14 1961.

Professor P. D. Ritchie will be overall chairman; the chairman of the morning session will be R. P. Yates, and the chairman of the afternoon session L. G. Stubbs.

The lecture programme is: 'Silicone Rubbers' by J. Ames (I.C.I. Nobel Division); 'The Reinforcement of Rubbers with particular reference to Conveyor and Transmission Belting' by G. Ogden (Turners Asbestos Co. Ltd.); 'The Properties and Application of Low Pressure Polythene with Special Reference to its use for Fibres' by Dr Schlimme (Chemische Werke Hüls); 'The Film Forming Properties of Polypropylene' by R. A. Ros (British Cellophane Ltd.); and 'The Moulding and Fabrication of Polypropylene' by M. P. Shaw or K. C. Ford (British Cellophane Ltd.).

The fee for the symposium is: students, 5s.; IRI and PI members, 15s.; and non-members, 25s. Tickets are available from L. Hopwood, I.C.I. Ltd., 4, Blythswood Square, Glasgow, C.2.

PATENT SPECIFICATIONS

The following information is prepared from published Patent Specifications by permission of the Controller of H.M. Stationery Office. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, W.C.2, at 3s. 6d. per copy (including postage).

Epoxy Moulds and Tools

No. 854,636. Leicester, Lovell and Co. Ltd. Application, February 17 1956. Filed, February 25 1957. Published, November 1960.

The use of synthetic resin tools to replace metal ones for economic reasons has been common practice for some time, but one of the main drawbacks is the wear resistance of such tools, which is in general much inferior to steel or alloy moulds. A tool can be made from cast plastic which has a long life due to a thin hard metallic skin on the working surfaces. A pattern mould is made and a thin metal skin formed on this by spraying or electro-deposition. The mould is then filled with a liquid epoxy resin system which on curing is removed from the pattern mould with the metal skin adhering firmly to it.

PVC Belting

No. 854,678. Goodyear Tire and Rubber Co. Application and Filed, October 6 1958. Published, November 23 1960.

In the manufacture of PVC belting by assembling pre-impregnated laminates by heating them separately and then applying pressure, it is difficult to obtain sufficient pressure or to apply the pressure soon enough after heating the plies to produce satisfactory belts.

The apparatus described to overcome this difficulty applies the laminating force by passing the plies through the nip of a pair of pressure rolls, one of which is cooled and supported, suitably pivotted to move relative to the other roll with its axis parallel to that of the other roll. The pressure applied must be in excess of 100lb. per in. width. The plies are then cooled below the fusing point of the PVC by passing them between moving surfaces which apply a pressure between 40 and 70 psi. This can conveniently be done by leading the laminated plies round a large diameter cooling drum and keeping them in contact with it by a continuous band passing over the drum and pulled against it by other suitably placed rolls one of which can conveniently be the lower of the two pressure laminating rolls.

Carbon Black Production

No. 854,750. Phillips Petroleum Co. Application and Filed, February 28 1957. Application in USA, June 29 1956. Published, November 23 1960.

A process for the production of carbon black of the SAF type consists of introducing a reactant hydrocarbon into a substantially cylindrical combustion zone, causing a mass of hot gas to helically envelope the hydrocarbon and passing the mixture into a cylindrical reaction zone. A liquid coolant is introduced directly into the carbon black containing reaction mixture within this zone at a point at which tar free carbon black is formed. It has been found that the point at which the quenching occurs along this reaction line has a substantial effect on the properties of the black formed. When the quenching is effected in the furnace proper and not further downstream the properties are substantially varied depending on the point within the furnace where initial quenching takes place.

BOOK REVIEW

POLYESTER RESINS.—By John R. Lawrence. (Reinhold Publishing Corporation, New York; Chapman and Hall Ltd., London. 251 pp., price 46s.)

This volume is the fifteenth of the Reinhold plastics application series to be published and is described in the foreword as 'semi-technical.' That is to say, one does not need to be a research chemist to understand it and it is intended for readers from technical school students to plastics engineers.

Reinforced plastics and polyester resins are becoming of increasing importance and the book covers many aspects of the industry from historic background, chemistry and curing mechanisms to manufacturing techniques and applications.

A chapter is devoted to the formulation of resins for special properties such as weathering and flame resistance and the section on coating applications gives a very comprehensive review of this relatively new use for polyesters.

Two of the four appendices are likely to be of more value to American readers than those in the UK as they give the properties of commercially available resins and a list of trade names for materials and processes, but the other two appendices consisting of a trouble shooters guide to polyester moulding and a reinforced plastics glossary are of more general interest and value.

This handy-sized book is concisely and clearly written, well provided with illustrations and tables, and should prove of use to technical and non-technical readers associated with the use of polyester resins.

•• Copies may be ordered through the Books Department, RUBBER JOURNAL AND INTERNATIONAL PLASTICS. Maclaren House, 131 Great Suffolk Street, London, S.E.1.

Rubber Statistics

UNITED STATES — MALAYA

THE United States Rubber Manufacturers' Association reports that total consumption of new rubber in December amounted to 112,710 tons against 122,144 in November.

Consumption in December comprised 31,555 tons of natural rubber and 81,155 tons of synthetic rubber (including 68,360 tons SBR).

Total synthetic rubber production in December was 104,741 tons against 110,405 tons in November, while production of SBR was 86,290 tons against 87,540 in November.

Total synthetic rubber exports in December were 23,350 tons against 23,026 tons in November.

Total consumption of rubber in USA during 1960 amounted to 1,555,111 long tons compared with 1,627,770 long tons consumed in 1959.

Consumption of all types of synthetic, amounting to 1,075,849 long tons in 1960, reached a new record level compared with the previous high of 1,072,726 long tons consumed in 1959.

Natural rubber consumption came to 479,262 long tons for 1960 compared with 555,044 long tons used in 1959. Of the total new rubber consumed in 1960, synthetic rubber amounted to 69.18%. The comparable ratio for 1959 was 65.90%.

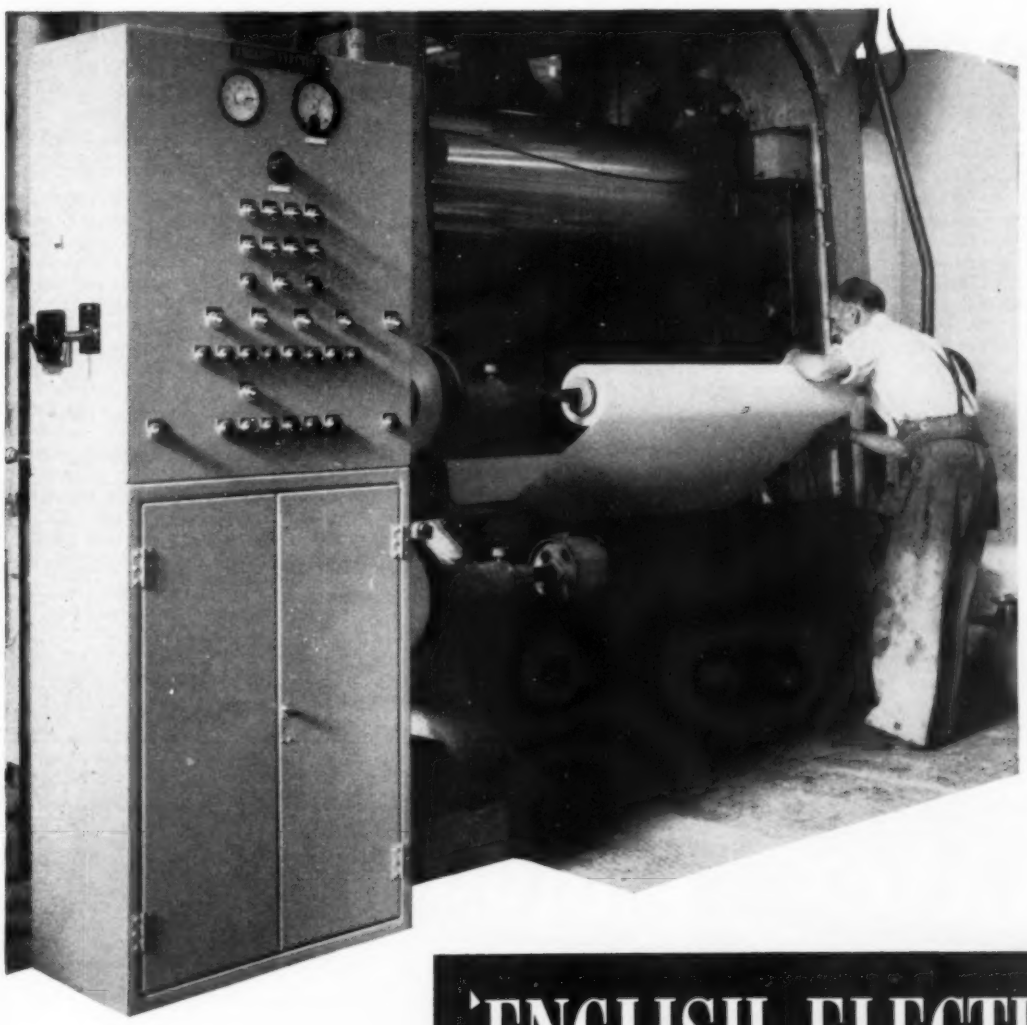
Malaya

December rubber shipments of sheet and crepe from Malaya totalled 91,746 tons, according to the Chief Statistician. The total comprised: UK 16,420 tons, USA 4,727, West Germany 6,996, other European States 24,300, Japan 7,841, Soviet Union 9,181, China 5,625, Commonwealth countries 8,013, other countries 8,643.

Latex and revertex shipments in December were 7,428 tons, comprising: UK 1,479, USA 1,121, West Germany 1,121, other European countries 1,741, Japan 914, Commonwealth 598 and other countries 454.

Shipments in November respectively totalled 86,291 tons and 7,533 tons, while those in December 1959 were 83,170 tons and 11,191 tons.

Some of Fablon's spring designs in self-adhesive vinyl covering (top to bottom, left to right): Marble, Fleck, Antiqua, American Rose, Spinet, Orion and Starflower



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Co-ordination of speed and tension between sections in the calender trains is obtained by Ward Leonard and Magnetic Amplifier Control. Dynamic braking on the mill drives gives rapid emergency stopping by which the rubber mill can be brought to rest with a roll travel of only 8½ inches.

THE ENGLISH ELECTRIC COMPANY LIMITED, ENGLISH ELECTRIC HOUSE, STRAND, LONDON, W.C.2
Electrical Plant Division, Stafford
WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON
PS.37A

PATENT SPECIFICATIONS

The following information is prepared from published Patent Specifications by permission of the Controller of H.M. Stationery Office. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, W.C.2, at 3s. 6d. per copy (including postage).

Epoxy Moulds and Tools

No. 854,636. Leicester, Lovell and Co. Ltd. Application, February 17 1956. Filed, February 25 1957. Published, November 1960.

The use of synthetic resin tools to replace metal ones for economic reasons has been common practice for some time, but one of the main drawbacks is the wear resistance of such tools, which is in general much inferior to steel or alloy moulds. A tool can be made from cast plastic which has a long life due to a thin hard metallic skin on the working surfaces. A pattern mould is made and a thin metal skin formed on this by spraying or electro-deposition. The mould is then filled with a liquid epoxy resin system which on curing is removed from the pattern mould with the metal skin adhering firmly to it.

PVC Belting

No. 854,678. Goodyear Tire and Rubber Co. Application and Filed, October 6 1958. Published, November 23 1960.

In the manufacture of PVC belting by assembling pre-impregnated laminates by heating them separately and then applying pressure, it is difficult to obtain sufficient pressure or to apply the pressure soon enough after heating the plies to produce satisfactory belts.

The apparatus described to overcome this difficulty applies the laminating force by passing the plies through the nip of a pair of pressure rolls, one of which is cooled and supported, suitably pivotted to move relative to the other roll with its axis parallel to that of the other roll. The pressure applied must be in excess of 100lb. per in. width. The plies are then cooled below the fusing point of the PVC by passing them between moving surfaces which apply a pressure between 40 and 70 psi. This can conveniently be done by leading the laminated plies round a large diameter cooling drum and keeping them in contact with it by a continuous band passing over the drum and pulled against it by other suitably placed rolls one of which can conveniently be the lower of the two pressure laminating rolls.

Carbon Black Production

No. 854,750. Phillips Petroleum Co. Application and Filed, February 28 1957. Application in USA, June 29 1956. Published, November 23 1960.

A process for the production of carbon black of the SAF type consists of introducing a reactant hydrocarbon into a substantially cylindrical combustion zone, causing a mass of hot gas to helically envelope the hydrocarbon and passing the mixture into a cylindrical reaction zone. A liquid coolant is introduced directly into the carbon black containing reaction mixture within this zone at a point at which tar free carbon black is formed. It has been found that the point at which the quenching occurs along this reaction line has a substantial effect on the properties of the black formed. When the quenching is effected in the furnace proper and not further downstream the properties are substantially varied depending on the point within the furnace where initial quenching takes place.

BOOK REVIEW

POLYESTER RESINS.—By John R. Lawrence. (Reinhold Publishing Corporation, New York; Chapman and Hall Ltd., London. 251 pp., price 46s.)

This volume is the fifteenth of the Reinhold plastics application series to be published and is described in the foreword as 'semi-technical.' That is to say, one does not need to be a research chemist to understand it and it is intended for readers from technical school students to plastics engineers.

Reinforced plastics and polyester resins are becoming of increasing importance and the book covers many aspects of the industry from historic background, chemistry and curing mechanisms to manufacturing techniques and applications.

A chapter is devoted to the formulation of resins for special properties such as weathering and flame resistance and the section on coating applications gives a very comprehensive review of this relatively new use for polyesters.

Two of the four appendices are likely to be of more value to American readers than those in the UK as they give the properties of commercially available resins and a list of trade names for materials and processes, but the other two appendices consisting of a trouble shooters guide to polyester moulding and a reinforced plastics glossary are of more general interest and value.

This handy-sized book is concisely and clearly written, well provided with illustrations and tables, and should prove of use to technical and non-technical readers associated with the use of polyester resins.

·· Copies may be ordered through the Books Department, RUBBER JOURNAL AND INTERNATIONAL PLASTICS. Maclaren House, 131 Great Suffolk Street, London, S.E.1.

Rubber Statistics

UNITED STATES — MALAYA

THE United States Rubber Manufacturers' Association reports that total consumption of new rubber in December amounted to 112,710 tons against 122,144 in November.

Consumption in December comprised 31,555 tons of natural rubber and 81,155 tons of synthetic rubber (including 68,360 tons SBR).

Total synthetic rubber production in December was 104,741 tons against 110,405 tons in November, while production of SBR was 86,290 tons against 87,540 in November.

Total synthetic rubber exports in December were 23,350 tons against 23,026 tons in November.

Total consumption of rubber in USA during 1960 amounted to 1,555,111 long tons compared with 1,627,770 long tons consumed in 1959.

Consumption of all types of synthetic, amounting to 1,075,849 long tons in 1960, reached a new record level compared with the previous high of 1,072,726 long tons consumed in 1959.

Natural rubber consumption came to 479,262 long tons for 1960 compared with 555,044 long tons used in 1959. Of the total new rubber consumed in 1960, synthetic rubber amounted to 69.18%. The comparable ratio for 1959 was 65.90%.

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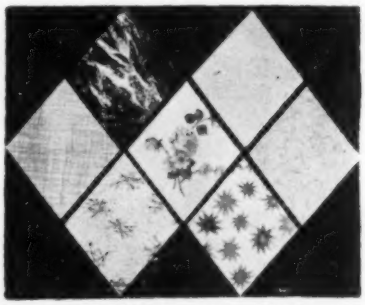
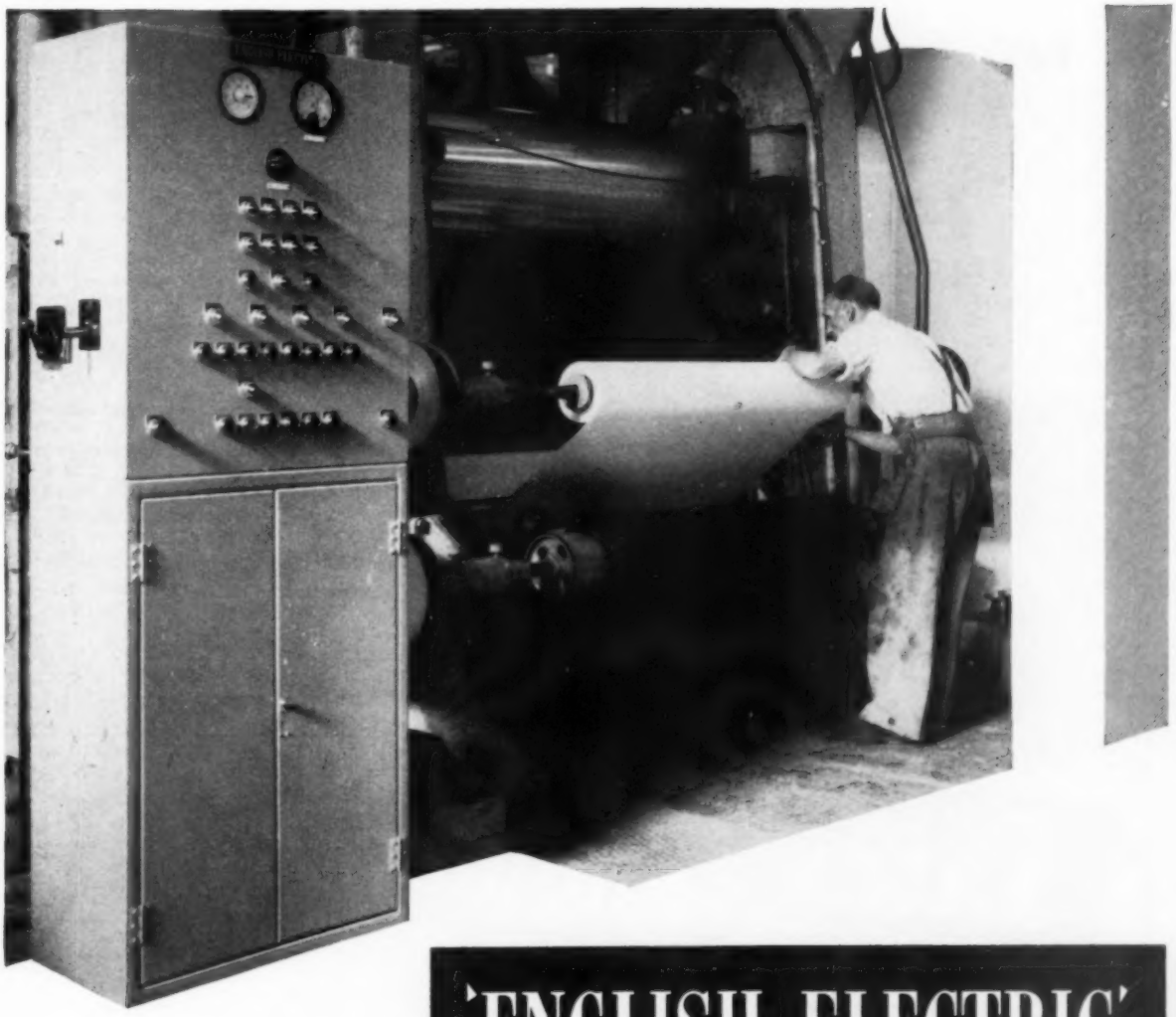


Some of Fablon's spring designs in self-adhesive vinyl covering (top to bottom, left to right): Marble, Fleck, Antiqua, American Rose, Spinet, Orion and Starflower



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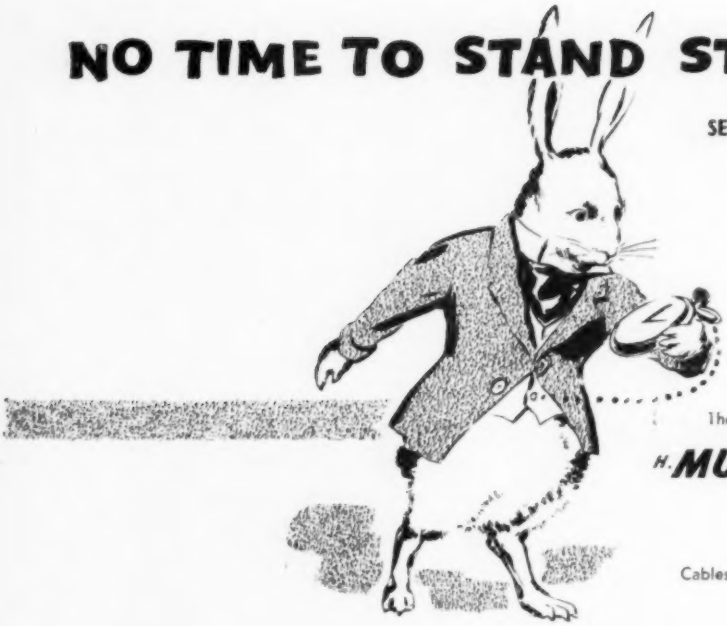

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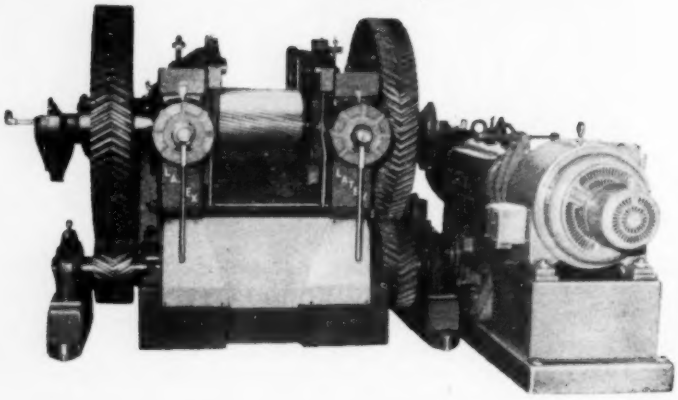

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Rubber and Plastics Stock Market

A REVIEW OF PRICES AND TRENDS

THE stock market punters have had the field to themselves just recently. One tip after another romped home past the post like a short odds favourite. Forecasts of terms too have been just about right in every case. All very exciting. However, looking back over the period under review here's one who is glad that he can withstand the tempting list of 'possibles' that have sprung up. And my advice to the small investor is that it would be wise to also cultivate a similar resistance streak. It is all very nice to job backwards and think of the nice things that could have happened to your bank balance if only you had had the courage. But to run with the pack — especially some of the more expert — can be dangerous. Remember that many who boast of a killing, the same that has been witnessed over the past week or so, have not always been as fortunate. Let them develop the ulcers and go without sleep at night. For the really genuine types who want to see their original stake grow into something really worthwhile having, it is better to stick to the more sensible view taking a long term look at making money.

One of the 'certs' that came off but did not necessarily pay off was the TURNER AND NEWALL offer for the share capital of BRITISH INDUSTRIAL PLASTICS. The other day Mr C. H. Glassey, the chairman of BIP, told shareholders that he and his directors had decided to recommend the bid to shareholders and are going to accept in respect of their own holdings. Turner and Newall offered one of their shares plus 28s. in cash for every seven BIPs. Glassey said that talks with Turner's had been going on for some months with this end in view. It began with discussions to see what the two companies had in common and it was found that there was considerable scope for expansion in structural plastics based on the combination of synthetic resins and fibres. He also added the important view that it had been his conviction for a long time that the next big break through in the plastics industry — comparable with that of manmade fibre — would be in structural plastics. This would require a consortium of technical knowledge, worldwide contact with engineers, architects and the like, and naturally considerable financial resources. Glassey feels the proposed 'marriage' will provide these needs.

Everyone was just getting over this bit of excitement when up popped DISTILLERS who — pardon the expression — 'popped the question' to BRITISH XYLONITE. Holders of Xylonite shares are given the opportunity of swopping two BX for five of the Distillers group. Cost — a cool

Continued on page 194

Share Price Movements

Par Value	Company	1960-61 High	Low	Jan. 21	Latest
£1	A.E. Ind. Ord.	67/-	39/-	42/3	41/3
5/-	Albright & W. Ord.	34/3	25/-	25/3	27/3
£1	" " " 5% Pref.	17/3	15/3	15/6	15/6
5/-	Anchor Chemical Ord.	18/7½	14/9	15/9	17/-
5/-	Andersons Rub. Ord.	—	—	3/9	3/9
£1	Angus Geo. Ord.	60/6	34/9	59/-	60/6
5/-	Ault & Wiborg Ord.	28/-	20/-	26/9	26/6
£1	Avon India Rubber Ord.	46/6	30/-	30/-	31/6
£1	" " " 6% Pref.	20/-	17/6	18/9	18/9
10/-	Bakelite Ord.	62/6	39/9	42/6	48/6
£1	" 6% Pref.	19/3	16/9	18/-	18/-
£1	Baker Perkins Ord.	46/6	40/-	42/-	42/3
4/-	Bank Bdg. Rubber Ord.	4/3	1/9	2/-	2/-
4/-	Bettix	—	—	7/9	8/-
4/-	Brammer H. Ord.	18/6	16/3	16/3	16/6
10/-	Bridge, David Ord.	66/6	48/-	50/-	49/-
5/-	Bright, John Ord.	18/6	14/3	14/9	16/-
5/-	Brit. Blting. & Asb. Ord.	—	—	17/6	17/6
£1	" " " Pref.	—	—	15/9	15/9
5/-	British Electronic Indus.	—	—	—	12/3
2/-	Brit. Ind. Plas. Ord.	12/1½	5/3	8/-	11/10½
2/-	" 10% (tax free) Pref.	4/9	4/3	4/9	4/9
£1	British Xylonite Ord.	80/3	50/6	65/-	80/-
£1	" " 5% Pref.	18/9	14/-	15/-	14/6
£1	BICC Ord.	61/3	47/6	55/3	57/1½
5/-	BTR Ind. Ord.	17/9	9/9	15/-	15/-
£1	" " 7½% Pref.	24/3	21/3	22/3	22/3
£1	Courtaulds Ord.	59/4½	42/-	43/-	42/6
£1	" 5% 1st Pref.	17/9	15/-	15/-	15/3
£1	" 6% 2nd Pref.	21/-	18/-	18/-	17/9
4/-	Cow, P. B. Ord.	9/9	6/9	8/-	7/10½
£1	" " 5% Pref.	15/6	14/-	14/-	14/-
1/-	Dannimac Mfg. Ord.	14/6	9/-	12/-	12/3
10/-	De La Rue Ord.	78/6	47/9	56/6	60/-
£1	" " " 3½% Pref.	12/-	10/-	10/-	10/-
10/-	Distillers Co. Ord.	38/3	27/9	31/-xc	32/9
£1	" " 6% Pref.	22/-	19/6	20/-	20/-
£100	" 5% Conv. Loan	£96	£93½	£93½	£95
£100	" 5½% Unsec. Loan	£97	£85	£85	£84½
10/-	Dunlop Rubber Ord.	30/6	19/9	22/-	21/9
£1	" " 5½% Pref.	19/-	15/6	15/6	15/6
£100	" 3½% 1st Debs.	£78	£68	£68	£69
£100	" 4½% 2nd Debs.	£87	£77½	£79½	£79½
£1	Eng. Elect. Ord.	53/6	30/9	33/6	32/6
4/-	Ebonite Cont. Ord.	14/3	7/9	8/-	8/-
£1	English China Clays Ord.	95/-	69/-	87/6	85/-
£1	Goodyear Tyre 4% Pref.	12/9	10/9	11/6	11/6
5/-	Greeff Chem. Ord.	35/-	23/-	23/-	26/-

Par Value	Company	1960-61 High	Low	Jan. 21	Latest
10/-	Greeff Chem. 5½% Pref.	9/-	7/9	7/9	7/9
5/-	Hackbridge Hldg.	8/7½	5/3	5/6	5/-
4/-	Greengate & Irwell Ord.	6/6	5/3	5/9	5/6
£1	Harrisons & Crosfield Dd.	64/-	48/6	48/6	48/9
1/-	Hunt & Moscrop Ord.	2/9	1/4½	1/7½	1/7½
£1	Imp. Chem. Ord.	75/3	54/3	64/3	72/-
£1	" " 5% Pref.	18/-	15/6	15/6	15/7½
£100	" 4½% Unsec. Loan	£89½	£80½	£81½	£81½
£100	" 5½% Conv. Loan	£212½	£90xc	£92½	£92½
1/-	Kleemann (O. & M.) Ord.	11/6	8/3	9/-	10/4½
£1	" " 6½% Pref.	19/-	17/-	17/-	17/-
5/-	Laporte Ind. Ord.	33/6	21/3	26/-	25/7½
£1	" " 7½% Pref.	24/3	23/-	23/-	23/-
£1	Leyland & Birm. Rubber Ord.	63/-	46/3	47/9	47/6
£1	" " " 6% Pref.	19/-	17/6	18/1½	18/3
2/-	London Rubber	14/9	11/-	14/9	15/-
£1	" 6% Red. Cum. Pref.	20/-	18/-	18/9	18/9
£1	McKechnie Bros. Ord.	71/6	57/-	57/6	57/6
£1	" " 'A' Ord.	69/3	55/-	55/-	55/-
£1	" " 6% Cum. Pref.	18/-	16/-	17/-	17/-
5/-	Monsanto Chem. Ord.	31/-	23/-	25/6	26/3
£1	" " 3½% Pref.	12/9	12/-	12/-	12/-
£100	" 6% Debs.	£103½	£97½	£98	£97
2/-	Movitex	—	—	—	6/6
5/-	Miles (H.G.) Hldgs. Ord.	11/3	8/1½	8/1½	8/1½
£1	North British Rubber	21/3	16/-	16/-	16/-
5/-	Northwestern Rubber	13/-	9/-	13/-	13/-
5/-	Plastic Enginrs. Ord.	30/-	20/-	28/9	28/6
5/-	Redfern Holdings Ord.	5/9	3/1½	3/6	3/6
2/-	RFD Ltd. Ord.	6/6	3/4½	4/9	4/6
£1	" " 5½% Pref.	14/6	12/9	13/9	13/9
2/-	Rubber Imp. Ord.	7/9	3/1½	3/6	3/9
2/-	" " 'A' Ord.	7/-	3/-	3/3	3/3
£1	" " 5% 1st Pref.	15/-	11/3	12/3	11/10½
5/-	Rubber Reg. Ord.	19/3	16/9	18/-	17/-
4/-	Shaw Francis Ord.	27/6	17/3	19/-	20/6
2/-	Silentbloc Ord.	13/3	8/6	8/6	8/9
5/-	Storey Bros.	41/9	28/3	36/-	38/-
2/-	Sussex Rubber Ord.	2/3	1/3	2/-	2/-
5/-	Sutcliffe Speak Ord.	15/9	11/-	14/-	13/9
£1	Tootals	33/6	26/4½	—	28/10½
£1	Turner & Newall Ord.	60/10½	48/3	58/9	59/9
£1	" " " 7% Pref.	25/-	21/3	21/3	21/3
5/-	Universal Asbestos Ord.	50/-	24/-	24/3	25/6
5/-	Viscose Dev. Ord.	16/6	14/9	15/-	15/-
5/-	Warne W. (Holdgs.) Ord.	18/9	14/9	15/9	16/3

Rubber Markets

LONDON

A small rally reflecting temporarily improved Eastern advices was not supported by any weight of trading, and demand was slow throughout. The downtrend was resumed. Factory interest was patchy and apart from short covering and switching of positions, dealers were disinclined to operate in face of slow world consumption and the heavy stock position in the East.

Latest prices are as follows:

No. 1 RSS Spot: 23½d.-23¾d.

Settlement House:

March 23⅝d.-23¾d.

April/June 23⅝d.-23¾d.

July/September 23¾d.-23⅞d.

October/December 23¾d.-23⅞d.

January/March (1962) 23⅞d.-24d.

No. 1 RSS cif basis ports:

February 23d.-23⅛d.

March 23⅛d.-23¼d.

April 23⅛d.-23⅜d.

Godown:

February 76¼ Straits cents nominal.

Latex

Centrifuged 60% latex per gallon in drums, seller, February, 13s. 7d., cif European ports. Spot, seller, 14s. 2d. Bulk, seller, d.w. 13s. 3d. Creamed, seller, 13s. 4d. nominal, February. Normal, seller, February, 11s. 5d.

NEW YORK

The New York rubber market ruled as under on January 30:

Dealers' Prices

US cents per lb., ex-dock

	Jan. 30	Previous
No. 1 RSS, Feb.	28⅛b–28⅛a	28⅛b–28⅛a
Mar.	27⅞b–28a	28⅛b–28⅛a
No. 2 RSS, Feb.	28b –28⅛a	28b –28⅛a
Mar.	27⅞b–27⅞a	28b –28⅛a
No. 3 RSS, Feb.	27⅞b–27⅞a	27⅞b–28⅛a
Mar.	27⅞b–27⅞a	27⅞b–28⅛a
No. 1 RSS, Spot	28⅛n	28⅛n
No. 3 amber blanket crepe, Feb. ..	24n	24⅜n

Futures—Rex Contract

	Jan. 30	Prev. Close
March ..	28.05t	28.30b–28.45a
May ..	27.75b–27.80a	27.95b–28.10a
July ..	27.75b–27.80a	27.85b–28.10a
September	27.75b–27.80a	27.85b–27.95a
Nov. ..	27.65b–27.80a	27.85b–27.90a
Jan. ..	27.60b–27.80a	27.80b–27.90a

Sales: 18. Tone: Quiet.

Futures were softer on January 30 on scattered selling in light dealings. Traders said the decline abroad induced the selling. Factory interest in physical rubber was light with the undertone softer.

SINGAPORE

The market ruled very quiet during the morning of January 30. Prices tended to ease and interest in February No. 1 RSS narrowed the discount to March. Some enquiry for lower sheets was met on the decline. Conditions in the afternoon were quiet with interest limited. Prices declined slowly on some Singapore trade selling. Lower sheets were in some demand again. After hours the market closed quiet. The market will reopen on Wednesday, February 1.

Malayan cents per lb., fob Malayan ports to open ports

	Jan. 30	Prev. Close
No. 1 RSS, Feb.	78¼–78½	79⅜–79⅝
Mar.	78⅜–78⅝	79¼–80
No. 2 RSS, Feb.	77½–78¼	79 –79½
No. 3 RSS, Feb.	77 –77½	78¼–78⅝
No. 4 RSS, Feb.	74¼–75	75½–76
No. 5 RSS, Feb.	64¼–65¼	66 –67
No. 1 RSS, Spot	78 –78¼	79¼–79½
No. 3 blanket thick remilled crepe, Feb. ..	62 –63	63 –64
No. 1 fine pale crepe, Feb. ..	82¼–83¼	83 –84
2x thin brown, crepe, Feb. ..	62 –63	62½–63½

Tone: Quiet.

The Industries Syndicate quote latex, native produce, 60% centrigufal, packed in rectangular drums, fob at 156.80d. per gallon.

AMSTERDAM

The Amsterdam rubber market ruled as under on January 30.

Guilders per kilo

No. 1 RMA	Jan. 30	Previous
January	2.30	2.32
February	2.30	2.32
March	2.30	2.32
January/March ..	2.30	2.32
April	2.30	2.32
May	2.30	2.32

Sales: Nil. Tendency: Easy.

DJAKARTA

A quiet tendency prevailed throughout Jan. 30 with sporadic transactions of No. 1 sheet at 30½ rupiahs per kilo, comprising about 15 tons. One broker reported small transactions of No. 2 sheet at 30 rupiahs per kilo. The market closed quiet owing to disappointing advices from Singapore.

Rupiahs per kilo

	Jan. 30	Previous
Spot No. 1 priok..	30.50b	31.00b
Spot No. 2 priok..	29.50b	30.00b
Spot No. 3 priok..	28.50b	29.00b
No. 1 fine pale crepe, spot ..	28.00b	28.50b

Tone: Quiet.

CEYLON

The price of No. 1 RSS at Colombo on January 30 was 85 (90) Ceylon cents per lb.

BANGKOK

The price of No. 1 RSS at Bangkok on January 30 was 26.00 (26.12½) US cents per lb.

STOCK MARKET

Continued from page 193

£12,700,000 for the whisky and gin giant which, of course, is now growing fast in plastics. The terms were based on an estimate that British Xylonite profits for 1960 will be 28% higher at £600,000. Holders of BX preference capital are also in on the deal getting the chance of exchanging into Distillers loan stock. Full particulars of both offers are to be sent out as soon as possible. Meantime the board of Xylonite mean to say 'yes' and recommend that their 'flock' follow suit.

These were two notable successes for the crystal ball gazers who dwell along Throgmorton Street, and it sparked off a wave of take-over fever the like of which has not been seen for many a long day. Right in the centre of this massive guessing game were the plastic groups with such firms as Bakelite and Storey Bros. placed high up on the list of future 'possibles.'

English China Clays had a setback on the news of the £2m. 'Rights' issue plans. Increased demand for products overtook the board's expansion plans and necessitated temporary and therefore expensive arrangements to satisfy demand. Because of this it has been decided to accelerate the programme of capital investment by raising new money. Full details are to be announced later. Net profits of the group come out at £1,703,905 as against last year's figure of £1,823,000. The dividend is 9% tax free compared with 8¾% net forecast.

Two new names appear in our price list. Best known probably to the general public is the Tootal tie and handkerchief business whose efforts to diversify have led them into the plastic field.

Along with Universal Asbestos, an offshoot of Tootals — Thermo Plastics — have joined together in a project to produce plastics materials for the building industry. As equal partners they have formed a new manufacturing company under the name of Allied Structural Plastics with an initial capital of £100,000. In a joint statement the parents of this offspring said: 'There is a great potential for the development of the use of plastics in the building industry.' Thermo Plastics is engaged in the processing and fabrication of plastics materials of all kinds, while UAM has long been established as a building materials producer.

Newcomer to the investment field is Movitex, which was given a warm welcome when it embarked on its Stock Exchange career the other day. A block of 250,000 ordinary 2s. shares were placed at 5s. 3½d. in the market. In first time dealings a good premium over this price was soon established and they have since moved ahead to 6s. 6d. The company makes perforated plastic panels and a range of products used for sales and information displays. One-fifth of its turnover is exported.

Industry INTELLIGENCE

Technical Data

Vinamul N742 Polishes

The introduction of self-gloss polymer emulsion polishes is one of the most important developments which has taken place in the polish industry in recent years. The new types of polish have better wearing properties and greater permanence than the traditional emulsified wax blends. Being based on synthetic products they are not subject to the quality variations of naturally occurring materials. Suitable for use on linoleum, vinyl and other plastic floor coverings these polishes are essentially blends of a synthetic polymer emulsion, an emulsified wax and a solution of an alkali-soluble resin. By varying the proportions of these three constituents it is possible to produce a range of polishes of differing properties for domestic and industrial applications.

Vinamul N742 is a modified polystyrene emulsion of uniform and ultrafine particle size and Technical Service Report No. T-10 issued by Vinyl Products Ltd., Carshalton, Surrey, gives details of its use in the production of polishes. Information is given on the resins and waxes, typical formulae and manufacture, test methods and properties obtainable.

Machines, Materials and Equipment

Holo-Flite Processor

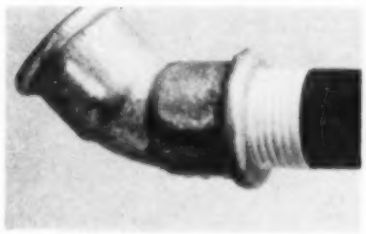
Publication No. 201, available from Holdan Engineers (London) Ltd., describes the Holo-Flite processor which is a continuous indirect heat exchanger combining maximum heat transfer area with minimum space requirements.

The heat transfer agent, which can be chilled water, brine or other refrigerant for cooling or steam or oil from a low pressure heating system for heating, is completely isolated from the material being processed and the heat transfer is achieved by contact with the hollow flights of two intermeshed rotating screws. The slow conveying, mixing, dispersing action of these screws is so gentle that there is said to be no dusting and a minimum of abrasion of solid particles undergoing processing.

Hilflon PTFE Tape

The PTFE division of William Rose Ltd., Lockfield Avenue, Brimsdown, Middlesex, following the introduction of a successful range of PFTE flexible hose assemblies just over a year ago, has recently extended the range of its products by the introduction of a sealant and insulation tape.

This tape is available in compact

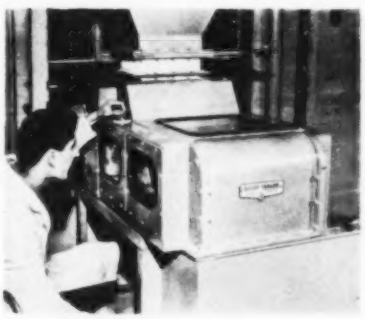


rolls from which it can be economically dispensed and is manufactured from unsintered PTFE. It is a compressible solid and easily moulds itself to all threaded materials. Its low coefficient of friction gives it unique anti-seizing properties so that joints can easily be broken after long periods of time. All types of pipe materials, plastic, metal, and ceramic can benefit by the use of Hilflon on threaded sections, imperfect threads offer no difficulty and cumbersome flange connexions can be simplified. As is well known the chemical resistance of PTFE to a wide range of corrosive materials is outstanding.

Continuous Weighfeeder

As the use of continuous cycling and automatic machinery increases, the need for a continuous weighfeeder as a standard piece of machinery has become more urgent.

Baker Perkins Ltd., Westwood



Works, Peterborough, have now developed such a machine to meet the basic needs of any continuous processing function. Since such a feeder is only weighing very small quantities of material at any instant, it is necessary to maintain a very high degree of accuracy and all live parts of the machine must be protected against collection of dust and from draughts.

The range of output has been made as wide as possible and the machine has been constructed to withstand the normal hazards of factory environment while still being sensitive enough to detect small changes in the small quantities being weighed at any time. The accuracy is ± 1%, based on one minute readings over any part of the machine's range, the output can be varied from 50lb. to 5 tons per hour and any individual machine can have approximately 10:1 output range within those limits.

Nitrile Gloves

The comprehensive range of industrial gloves offered by Lewis Gilder and Co. Ltd., 44 Bedford Row, London, W.C.1, has recently been extended by the addition of lightweight wrist gloves made from British Geon Hycar nitrile rubber. These are available as shown in the illustration in either smooth or rough finish and it is hoped that in the near future the range will be extended still further.

These gloves, although more expensive than natural rubber, neoprene or PVC types, offer advantages in their resistance to a wide range of chemicals, oils and solvents, and should be

superior to any other glove in service life.

Although not particularly recommended for use in contact with chlorinated solvents, phenols, creosote or chemical closet fluids, nitrile rubber should still be superior to other materials.

Publications

Injection Moulding Propathene

IS Note No. 614, issued by the Technical Service and Development Department, I.C.I. Plastics Division, Welwyn Garden City, deals with the injection moulding of Propathene. The features of the material are discussed which distinguish it in its moulding behaviour from other thermoplastics.

All grades of Propathene contain sufficient stabilizers to protect against degradation during normal moulding operations. Where the molten polymer may be subjected to high temperatures for long periods, such as in moulding thick sections it may be advisable to use H type which are more highly protected, while for thin sections or where the appearance is of particular importance the film grade is to be preferred.

Also discussed in the booklet are the optimum moulding temperatures, moulding machines, mould design and mould shrinkage.

Synthetic Rubber Prices

Prices of synthetic rubbers appear regularly in RUBBER JOURNAL AND INTERNATIONAL PLASTICS *in the first week of each month. It will be appreciated if suppliers will give notification of any price changes or additions to their range. C/f duty paid quotations are subject to slight variation due to exchange, ocean freight and insurance fluctuations. Prices are in pence per lb., except where otherwise stated. Grades are expressed as follows:* 1001/2/6 = *grades* 1001, 1002 *and* 1006.

(e-qdp)—Ex-quay duty paid (cifUKdp)—cif UK duty paid (e-i)—Ex-installation (ddp)—Delivered duty paid (e-sUK)—Ex-store UK (ex-wUK)—Ex-warehouse UK (d)—Delivered BM—black masterbatch CBM—cold, black masterbatch CNP—cold, non-pigmented CNS—cold, non-staining COE—cold, oil extended COELC—cold, oil extended, light coloured CO/BM—cold, oil/black masterbatch CPOE—cold, pigmented, oil extended CRE—cold, rosin extended dw—Dry weight HN—high nitrile HNP—high nitrile, powder HP—hot, pigmented HS—high styrene HMW—high mol. wt. LMW—low mol. wt. MHN—medium high nitrile MLN—medium low nitrile MMW—medium molecular weight MN—medium nitrile NS—non-staining TS—total solids RTV—room temp. vulc.

SBR TYPES AND HIGH-STYRENE RUBBER

Ameripol (Goodrich Gulf) (e-qdp)
(min., 70,000-lb. lots)

1000/1	Hot, Non-Oil	23.1
1002/6/7	,, ,,	23.34
1009/11	,, ,,	23.71
1012	,, ,,	23.24
1013	,, ,,	23.94
1500/1/2	Cold, Non-Oil	23.1
1703	COE, 25% Oil	*20.31
1705	,, ,, ,,	*20.07
1707/8	,, 37.5% Oil	*18.89
1710/12	,, ,, ,,	*18.66

*Under 70,000 lb., min. 600 lb.

ASRC (American Synthetic Rubber Corpn.) (e-sUK)

1004/6	Hot, non-oil	22.25
1009	,, ,,	24.0
1018	,, ,,	24.75
1019	,, ,,	24.5
1500/2/7	Cold, non-oil	22.25
1503	,, ,,	24.25
1703	COE	20.5
1708	,,	18.0
1712	,,	17.75
1713	,,	16.75
3014	Hot, non-oil	25.75
3105/6	Cold, non-Oil	22.25
3110	,, ,,	24.0

Cariflex (Shell Chemical) (e-sUK)

S-1000	Hot	22.25
S-1002	,,	23.375
S-1006	,,	22.25
S-1009/11/13	,,	24.0
S-1500/2/9	Cold	22.25
S-1600/2	CBM	19.625
S-1605	,,	19.375
S-1606	,,	18.75
S-7652	,,	20.0
S-1703	COE	19.25
S-1707	,,	18.0
S-1709/12	,,	17.75
S-1803	COBM	17.875
S-1806	,,	16.625
S-1807	,,	17.375
S-1803	,,	15.25

FR-S (Firestone) (delUK*)

1000/1/4/6/7 and 195	Hot	22.50
1500/2 and 146	Cold	22.50
1703 and 173	OE	19.11
1710/12 and 184	,,	18.00
178	,,	18.25
201	,,	16.71
1009	UK Specialty	23.06
1012 ,,	,,	22.59
1013 ,,	,,	23.59
1014 ,,	,,	26.18
181 ,,	,,	22.50
182 ,,	,,	23.29
147 ,,	,,	20.94
158 ,,	,,	28.00
158-S		27.50

*Import Duty not included

Int. Synthetic Rubber (d)

Intol 1500/2	22.5
Intol 1509	22.5
Intol 1570	23.5
Intol 1006	22.5
Intol 1710	18.0
Intol 1712	18.0
Intol 1778	18.25

Naugapol (Naugatuck Chemical) (e-sUK)

1016	28.0
1018	28.5
1019	28.0
1022	31.0
1023	32.75
1503	27.75
1504	34.5
6101	26.25
6102	27.75
K-45	30.75
K-50	31.5
KO-50	29.0
6003	28.5
6100	32.25

ANIC (e-qdp)

1500	22.25
1502	22.25
1708	18.00
1712	17.75

Philprene (Phillips) (d)

1000/6	Hot, non-pig.	22.50
1009	,, ,,	24.25
1018	,, ,,	26.97
1019	,, ,,	26.50
6701	,, ,,	24.23
1500/2	CNP	22.50
1503	,,	26.27
6630	,,	25.18
6632	,,	24.23
1601	CP	19.70
1603	,,	19.80
1605	,,	19.625
1606	,,	19.00
1608	,,	18.90
1609	,,	21.12
6662	,,	18.90
6655	,,	19.80
1703	COE	20.75
1708	,,	18.25
1712	,,	18.00
6700	,,	18.01
1803	CPOE	18.125
1805	,,	16.11
1808	,,	16.50
6608	,,	15.27
6753	,,	15.61
6754	,,	15.45
6755	,,	17.68

Plioflex (Goodyear) (ex-wUK)

1006	HNP	22.25
1500/2/7/8	CNP	22.25
1006	S	22.75
1703	COE	19.25
1710/12	,,	17.75
1773	COELC	19.25
1778	,,	18.0
B—6		27.5
B—5		28.0

Polysar (Polymer UK) (e-sUK)

S Hot	22.25
S-630 Hot	22.25
Kryflex 200 Cold	23.5
Krylene	22.25
Krylene NS	22.25
Krylene 602 Cold	22.25
Krynol 651 COE	17.75
Krynol 652 ,,	18.0
3-X 371 Process Aid	24.0

Synpol (Texas-US Chemical) (e-qdp)

1000/1	Hot	22.25
1002	,,	22.47
1006/7	,,	22.25
1009	,,	22.81
1012	,,	22.38
1013/61	,,	22.25
X274	,,	23.45
8000	,,	22.25
1500/02/51	Cold	22.25
1703	COE	19.25
1707/8	,,	18.0
1711	,,	17.88
1712	,,	17.75
8200	,,	18.0
8201	,,	16.6
8202	,,	16.38
8152	CBM	18.6
8151	COBM	18.2
8253	,,	15.84
8254	,,	15.45
8255	,,	14.8
8267	,,	16.4

(Masterbatch prices US cents per lb. fas Gulf ports)

SBR LATICES

Copo (Copolymer) (cifUKdp)
(10-ton lots)

2101	(dw)	46.3
X-765	,,	40.8
X-800	,,	37.2
2102/3	,,	38.0

Pliolite Rubber (Goodyear) (d)

2000	40

Latex (dw)

2001/4/5/8	40
5350	40

Pliolite Resin (Goodyear) (d)

101A	(dw)	44
150	,,	50
151	,,	35
160	,,	50
170	,,	50

Hycar (B. F. Goodrich) (ddp)

2507 (HS) dw	48

Polysar (Polymer UK) (e-sUK)

Latex, type IV	32.5 TS
Latex, type 722	31.75 TS
(Non-returnable 45-gallon drums)	(e-i)
Latex, type 722 (bulk quantities)	28.75 TS

Int. Synthetic Rubber (ex-wks)

Intol Latex M23B/R23/F28	22.25
Intol Latex 62A	27.0

Dylex (Koppers Int. CA) (fas)

K-42A/52/31/900	31.6

ACRYLONITRILE TYPES

Butaprene N (Firestone) (cifUKdp)

NL	52.5
NAA	56.25
NF	51.5
NXM	60.18

Chemigum (e-s)

N—1	7[illegible]
N—3A	52
N—5	52
N—6G/7/8/600X	45

Hycar (British Geon) (UKd)
(500-lb. lots and over)

1001	High Nitrile Hot	52
1041	,, ,, Cold	52
1002	MHN Hot	45
1042	,, Cold	45

Hycar (B. F. Goodrich) (ddp)
(500-lb. lots and over)

1411	HNP	66
1432	MHN (crumb)	64
1072	,, (carboxyl)	66
1312	,, (liquid)	55
1043	MLN	51
1014	Low Nitrile	61

I.C.I. (min., 5-cwt. lots) (UKd)

Butakon A-4051 HN Cold	52
Butakon A-3051 MN Cold	45
Butakon A-3002 ,, ,,	45

Paracril (US Rubber) (dwe-sUK)

18-80	Low Nitrile	61
AJ	,, ,,	50
B	MLN	51
BJ	,,	51
BLT	,, Cold	51
BJLT	,, ,,	51
C	MHN	59
CLT	,, Cold	59
CV	,, (crumb)	63
D	High Nitrile	67
ALT		51
OZO		47

Polysar (Polymer UK) (d)

Krynac 800 MN	45
Krynac 802 LN	45
Krynac 803 MN (low Mooney)	45
Krynac 801 HN	52
Krynac 804 (MN-cross linked)	45

ACRYLONITRILE LATICES

Butaprene N (Firestone) (cifUKdp)

N-300 (dw)	53
N-400 ,,	60.5

Chemigum Latex (Goodyear) (d)

200	(dw)	65
235/6	CHS ,,	60
245	B ,,	52
245/6/7/8	CHS ,,	52

Hycar (B.F. Goodrich) (ddp)
(dry weight, drum lots)

1551 High Nitrile	66
1552 MHN	57

Hycar (British Geon) (UKd)
(dry weight, 3 drums and over)

1561 High Nitrile	60
1571 ,, ,, (carboxyl)	60
1562 MHN	52
1577 (modified)	52

ACRYLIC TYPES

Hycar (B. F. Goodrich) (ddp)

4021 Slab, 500 lb. and over	144
4501 Latex, dry weight	96

BUTYL TYPES

Esso (e-sUK)

Regular 035/150/215	21.75
Regular 217/8	21.75
Regular 325	21.75
Non-staining 165	22.75
Non-staining 268	22.75
Non-staining 365	22.75

Polysar (Polymer UK) (e-sUK)

Butyl 100/200/300		21.75
Butyl 301/400	NS	21.75
Butyl 101	NS	26.25
Butyl 402	NS	22.5

Hycar (B. F. Goodrich) (ddp)
(500 lb. and over)

2202 Brominated	68

NEOPRENES

		(ddp
W	(dwdel)	42.62
WHV	,,	38.5
WRT	,,	48.37
WX/GN/GNA	,,	44.62
GRT and S	,,	45.62
AC	,,	57.125
KNR	,,	75.62
AC 'M' and 'S'	,,	57.125
CG/AD	,,	57.125

The above prices refer to neoprene produced in the U.S.A. Prices of neoprene types produced at Du Pont's Maydown, Northern Ireland, plant are as follows:

W	(dwdel)	38.5
WRT	,,	44.0
WX	,,	40.5

Latices—Dry
(per lb. del, min., 50 lb.)

571	49.75
842A	49.75
572	51.25
601A	51.87
650	54.125
735	51.25
736	51.25
950	58.25
60	51.87
750	51.25
635	53.62

SILICONE RUBBERS

Midland Silicones
(500-lb. lots del)

Stocks	16s. 6d. to 35s.
Pastes	26s. to 35s.
Gums and base stock	36s. to 42s.
Cold-curing silicone rubber	20s. and 23d. 6d.

I.C.I. Silicones

Gums (40-lb. lots del)	39s. 6d.-47s.
Stocks (250-lb. lots del)	22s.-35s.
Pastes (1000-lb. lots del)	27s.6d.-35s.9d.
Silcoset (RTV) (250-lb. lots del)	21s. to 24s.

REINFORCING RESINS AND RUBBERS

I.C.I. (min., 2-ton lots) (UKd)

Butakon S-8551	36.5
Butakon S-7001	33.5

Hycar (B.F. Goodrich) (ddp)

2007 (powder)	42.5

Pliolite (Goodyear) (d)

S—6B	36.5

Polysar (Polymer UK) (e-sUK)

SS-250 HS (bale)	27.25
SS-250 ,, (flake)	27.5
Kryflex 252 HS	25.5
Kryflex 202 (HMW Cold polymerized)	25.75

Cariflex (Shell) (e-sUK)

SP-103	27.75

Cyclite (Durham Raw Materials) 42

HYPALON

	(ddp)
20	48
30	60.25
40	50.75

IRI Golf

MANCHESTER SECTION

THE Manchester section of the Institution of the Rubber Industry Golfing Society will hold its qualifying round for the Wallwork Cup on May 10, at Stockport Golf Club, Offerton.

Other 1961 fixtures are: Wallwork Cup final, June 10/11/12 at Gleneagles; Manchester Challenge Cup and Invitation Day, June 26, at Wilmslow Golf Club, Knutsford; Captain's Prize Competition, July 10 at Romiley Golf Club, Romiley; Bridge Trophy Competition, September 13 at Rochdale Golf Club, Rochdale, and Autumn Competition, October 16 at Royal Lytham and St. Anne's Golf Club.

New Epoxy Resin

A polyfunctional solid epoxy resin has been added to the range of Epophen resins manufactured by Leicester, Lovell and Co. Ltd., North Baddesley, Southampton, which is said to represent a significant advance in the chemistry of epoxys. Unlike the normal *solid* epoxy this material has an epoxy value at least equal to the best *liquid* bisphenol epoxy and shows a marked improvement in thermal chemical and electrical properties over other available resins.

The high reactivity makes possible rapid moulding cycles and this has led to the adoption of this new product for matched die moulding of car components and the production, from pre-impregnated material, of tubing.

Osborn Becomes OSMA

G. H. Osborn Building Products Ltd. has changed its name to Osma Plastics Ltd.

The company says that this change will in no way affect the conduct of business. The company will continue to operate as suppliers of plastics building products and as a reinforced plastics trade moulding organization specializing in mass production.

FBRAM on FBRAM

'Why a Federation' a two-colour booklet published by the Federation of British Rubber and Allied Manufacturers, describes the work that this organization does for individual rubber firms and for the industry in general.

It is available from 43 Bedford Square, London, W.C.1.

TRADE MARKS

Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any money order office. The extracts—from 'The Trade Marks Journal'—given below are reproduced by permission of the Controller of H.M. Stationery Office.

WITCH (786,089) Devices of metal or of plastics for use in threading needles. Edmund Von Ullisperger and Emmy Ullisperger, trading as E. Huff and Co., Hauptstrasse 32, Bergerhausen Kreis, Bergheim/Erft, Germany. Address for service is c/o Haseltine, Lake and Co., 28 Southampton Buildings, Chancery Lane, London, W.C.2. (Class 26; January 4 1961.)

(742,177) Games (other than ordinary playing cards), playthings, gymnastic and sporting articles (except clothing), parts included in Class 28 of the aforesaid goods; and handles and handle grips, all for toy vehicles; all the aforesaid goods being made of or coated with celluloid or plastics; but not including fish hooks or any goods of the same description as fish hooks. Bluemel Brothers Ltd., Wolston, near Coventry. (Class 28; January 4 1961.)

DUROXYN (806,687) Synthetic resins for use in manufactures, and adhesives for industrial purposes. Chemische Werke Albert (a body corporate organised and existing under the laws of Germany), 10-14 Albertstrasse, Wiesbaden-Biebrich, Germany. (Class 1; January 10 1961.) Address for service is c/o Frank B. Dehn and Co., Kingsway House, 103 Kingsway, London, W.C.2.

Esso Chlorobutyl Price Cut

The Esso Petroleum Co. Ltd. announce that from February 1, Chlorobutyl MD-551, which has been available in experimental quantities, is now being produced on a commercial scale. The polymer will be known in future as Butyl HT 10-66 and has been reduced in price to 2s. 6d. per lb. ex-store, duty free.

An article on chlorobutyl rubber appeared in last week's *RJIP*, page 125.

A step up from the humble jam jar for catching tiddlers is this American 'minnow bucket trap,' moulded of Eastman's Tenite butyrate. A snap-on cap of bright red polythene is said to attract the minnows

NEW COMPANIES

Holloway Containers Ltd. (678,263). — December 19. Capital: £1,000 in £1 shares. To carry on the business of manufacturers of and dealers in fancy goods, plastic materials, boxes, trunks, suitcases, handbags, etc. The first directors are: Albert R. Holloway, Derings, Lockley Park, Welwyn Garden City; Harold S. Holloway, Camrose House, Digswell Park Road, Welwyn Garden City; Donald C. Cann and Joseph W. Turner (all directors of E. R. Holloway Ltd., etc.). Regd. office: Bessemer Road, Welwyn Garden City, Herts.

D. Weight Ltd. (678,246).—December 19. Capital: £100 in £1 shares. To carry on the business of general and mechanical and hydraulic and electrical engineers; manufacturers of and dealers in injection moulding machines and plastic extruders, etc. The first directors are not named. Solicitors: Theodore Goddard and Co., 5 New Court, W.C.2.

Glass Fibre Construction Co. Ltd. (678,326).—December 20. Capital: £1,000 in £1 shares. To carry on the business of manufacturers, producers and processors of and dealers in glass fibres and synthetic resin materials of all kinds, plastic modelling and moulding materials and compositions, etc. The directors are: Howard G. Shepherd, 43 Green Crescent, Rowner, Gosport, Hants.; David L. Shepherd, 2 Priory Road, Hardway, Gosport. Solicitors: Blake, Lapthorn, Roberts and Rea, Gosport.

Trimby Maynard Ltd. (678,382). — December 20. Capital: £10,000 in 10,000 founders' shares of 2/- and 9,000 ordinary shares of £1. To carry on the business of agents for the buying and selling of rubber, gutta percha, balata, coffee, cocoa, spices, tea, cinchona, etc. The first director is Laurence H. Trimby. Regd. office: 15 Fish Street Hill, E.C.3.

Leather Assemblies Ltd. (678,347). — December 20. Capital: £100 in £1 shares. To carry on the business of manufacturers and preparers of plastic materials, fur and skin dressers, tanners, etc. The first directors are: John C. Stephenson, Rose Cottage, Becley, Redditch, Worcs. (director of John Hatherill, Stephenson and Co. Ltd., etc.); Noel A. Handley, 2 Lombard Street West, West Bromwich (director of Stephenson (Plastics) Ltd., etc.). Regd. office: 10 Butts Road, Walsall.

Stretchables International Ltd. (678,585).—December 21. Capital: £100 in £1 shares. To carry on the business of manufacturers of threads, yarns, fabrics and textiles of all kinds, etc. The first directors are: Patrick K. Drury, The Spinney, Leigh Place, Cobham, Surrey; Geoffrey M. Lewis, 6 Oakley Street, S.W.3. Regd. office: 62 London Wall, E.C.2.

Injection Services and Supply (London) Ltd. (678,630). — December 22. Capital: £2,000 in 1,000 voting and 1,000 non-voting shares of £1. To carry on the business of hydraulic, plastic, mechanical, motor, oil fuel and general engineers, etc. The first directors are: Kenneth J. Smith, 8 Verulam Avenue, Purley, Surrey (director of K. T. C. Holmes Ltd., etc.); Alfred V. Bristow, 50 Goodwin Road, Croydon; Edward Dashwood, Windy Ridge, Ring Road, Lancing (director of K. T. C. Holmes Ltd., etc.). Regd. office: 48 London Fruit Exchange, E.1.

Femco Plastics Ltd. (678,680).—December 22. Capital: £8,000 in £1 shares. The directors are: Vincent Cheek, Gravel Hill Shaw, Ham Hill, Meopham, Kent; Edwin W. Messeter, 19 Wyvern Close, Dartford, Kent; Reginald A. Foord-Divers and Ronald G. Saffron. Regd. office: Hedge Place Road, Horns Cross, Greenhithe, Kent.

Purley Tyre and Battery Co. Ltd. (678,967).—December 28. Capital: £1,000 in £1 shares. To carry on the business of dealers in and manufacturers of rubber, tyres, tubes, belts, batteries and accumulators, etc. The first directors are: William H. Ridler and Mrs. Dorothy M. Ridler, both of 7 Savile Close, New Malden, Surrey; William Ridler, 138 Elm Walk, Raynes Park, S.W.20. Regd. office: 173 Brighton Road, Croydon, Surrey.

Ixion Drives Ltd. (679,054).—December 29. Capital: £5,000 in £1 shares. To carry on the business of manufacturers, fitters, repairers of balata, hair, rubber, cotton and leather, plastic, metal, flax, hemp, jute, wool, silk, fibro and other fibrous substances or mixtures of any kind and type of fibre belts and bands, straps, cables, etc. The first directors are: Joseph Dawson and Margaret Dawson, both of

Butterhouse, Dobcross, near Oldham (both directors of Arthur Greaves (Lees) Ltd., etc.); Martin G. Dawson, Station Works, Shaws Lane, Uppermill, near Oldham. Regd. office: Station Works, Shaws Lane, Uppermill, near Oldham.

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Flash Mills (Direct Supplies) Ltd. (679,516).—January 3. Capital: £1,000 in £1 shares. To carry on the business of manufacturers of and dealers in raincoats, etc. The first directors are: Bella Kershner, Lily Green. Regd. office: 7 Brazennose Street, Manchester, 2.

Oral Precision Dental Laboratory Ltd. (679,705).—January 5. Capital: £100 in £1 shares. To carry on the business of dental mechanics, etc. The first directors are: Jack E. Manning and June D. Manning. Regd. office: 52 Lillie Road, S.W.6.

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ENGINEER wanted to assist in development work at rubber and plastics factory. Age 23/27 preferred, with drawing office or machine shop experience. O.N.C. or studying. Factory now in Hertfordshire but accommodation available when move to East Anglia completed late 1961.—Details of qualifications, experience, and salary required to Box 798. (798)

DIRECTOR FOR RUBBER DEALING COMPANY

A director, 30/45 years old, required by large well-established company dealing in rubber and distributing it to end users. Applicants should have received a good education and be experienced rubber traders. Initial salary £1,500-£4,500 per annum depending on experience, plus commission on results. Generous pension arrangements.—Please write, in confidence, to Box 796. (796)

RUBBER moulding foreman required to take charge of press department in well-appointed factory in South Wales, which is at present producing a full range of rubber components. Applications will be treated in strictest confidence.—Box 806. (806)

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A vacancy exists in the above Company for an experienced *Work Study Engineer* to join their Work Study Team. A new factory is opening shortly at Yeovil which will incorporate the most modern technique in rubber manufacture and the Work Study Department will be of central importance.

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MIDLAND SILICONES LIMITED AT BARRY, SOUTH WALES

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(a) **Product Development Group.** Graduate chemists are required to undertake product development work in the fields of organo-silicon chemistry and silicone polymers. Problems are of both short term and long term nature and the work should appeal to Research Chemists who wish to see the results of their work translated directly into useful materials. Applicants should be aged 25/32 and should preferably have had experience in industry, in research or development. A knowledge of polymers, plastics, rubber or fibres. Ref. No. 57.

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RUBBER chemist/technologist required by a progressive medium sized rubber company to fill the position of chief chemist. Applications are invited from chemists with experience in compounding, process control and development. A contributory pension scheme operates. Housing assistance will be given. All applications will be treated in confidence.—Write stating age, present salary and full details to Box 803. (803)

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INDEX to ADVERTISERS

	Page
Abrasive Developments Ltd.	viii
A.E.W. Ltd.	—
Allcock, J., & Sons Ltd.	iv
Amalgamated Oxides (1939) Ltd.	—
Anchor Chemical Co. Ltd.	169
Anderson, Joseph, & Sons Ltd.	i
Armour Hess Chemicals Ltd.	—
Ashley Associates Ltd.	—
Associated-Rediffusion Ltd.	—
Astor Boisselier & Lawrence Ltd.	—
Baker Perkins Ltd.	—
Barfoot, T. W., & Webb, W. F.	—
Barwell Engineering Ltd.	—
Belgrave Industries (Exports) Ltd.	—
B.I.P. Chemicals Ltd.	—
Birch, Singleton, W., & Sons Ltd.	—
Boston Marine & General Eng. Co. Ltd.	—
Bridge, David, & Co. Ltd.	181
Bright, John, & Bros. Ltd.	Cover ii
British Electrical Development Association	—
British Geon Ltd.	Cover i
British Nylon Spinners Ltd.	—
British Recovered Rubber Co. Ltd.	—
British Resin Products Ltd.	—
British Titan Products Co. Ltd.	—
Bush Beach & Segner Bayley Ltd.	—
Cabot Carbon Ltd.	177
Carter Bros. (Rochdale) Ltd.	—
Carlton Press Knives Ltd.	—
Chance & Hunt	—
C.I.C. Engineering Ltd.	—
Cleggswood Oil Distillery Ltd.	—
Cohen, George, Sons & Co. Ltd.	—
Columbian International (Gt. Britain) Ltd.	—
Consolidated Zinc Corporation (Sales) Ltd.	—
Corrosion Exhibition	—
Crosfield, Joseph, & Sons Ltd.	—
Croxton & Garry Ltd.	202
Derrick Davis Plastics Ltd.	—
Dietzel, Hugo	—
Dixon, T. H., & Co. Ltd.	—
Docker, John, & Co. (Engineers) Ltd.	165
Dunlop Rubber Co. Ltd.	—
Du Pont Co. (United Kingdom) Ltd.	—
Durham Raw Materials Ltd.	—
Economist Intelligence Unit Ltd., The	—
Ellison, George, Ltd.	—
English Clays Lovering Pochin & Co. Ltd.	201
English Electric Co. Ltd., The	191
Esso	—
eur-O-matic	iv
Fawcett Preston & Co. Ltd.	—
Ferguson, A. O., & Co. Ltd.	—
Ferguson, James, & Sons Ltd.	—
Ferguson Shiers Ltd.	—
Firestone Tyre & Rubber Co. Ltd.	—
Foamair Ltd.	—
Goodyear Tyre & Rubber Co. Ltd.	—
Greeff, R. W., & Co. Ltd.	—
Gresham & Craven Ltd.	182
Gummi und Asbest	—
H. K. Import & Export Ltd.	—
Halsteads Engineers (Leyland) Ltd.	—
Hankin, Geo., & Co. Ltd.	200
Hardman & Holden Ltd.	—
Hatcham Rubber Co. Ltd.	viii
Hay & Robertson Ltd.	—
Hilton, Wallace, & Co. Ltd.	201
Hubron Rubber Chemicals Ltd.	—
Hughes & Hughes Ltd.	—
Hunt Heat Exchangers Ltd.	—
Iddon Bros. Ltd.	—
Iliffe Industrial Publications Ltd.	i
Imperial Chemical Industries Ltd. (Billingham)	—
Imperial Chemical Industries Ltd. (Dyestuffs)	171
Imperial Chemical Industries Ltd. (Plastics—Butakon)	—
Imperial Chemical Industries Ltd. (Terylene)	—
Institution of the Rubber Industry	—
International Corporation Ltd.	—
International Synthetic Rubber Co. Ltd.	166
Ioco Ltd.	—
K. W. Chemicals	—
Kautschuk und Gummi	—
Kendell, T., & Sons Ltd.	vi
Ketjen Carbon	—
Laporte Titanium Ltd.	179
Latex Engineering Co.	192
Lavino (London) Ltd.	v
Leaver, Donald Ltd.	—
Leeds & Bradford Boiler Co. Ltd., The	—
Lindsay & Williams Ltd.	—
Lonabarc Ltd.	—
London & Scandinavian	—
Lord, R., & Sons Ltd.	iv
McKechnie Bros. Ltd.	182
Maclaine, Watson & Co. Ltd.	—
Metal Box Co.	—
Micafine Ltd.	ix
Monsanto Chemicals Ltd.	—
Muehlstein, H., & Co. (London) Ltd.	192
Muller, Max	—
National Rubber Bureau	—
Nederlandsch Verkoopkantoor Voor Chemische Producten N.V.	—
New Conveyor Co. Ltd.	—
Noble Lowndes Pension Service, The	—
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Preston Tyre Fabric Manufacturing Co. Ltd.	—
Price's (Bromborough) Ltd.	—
Pullen, James H., (1942) Ltd.	ix
Reed Bros. (Eng.) Ltd.	175
Revue Generale du Caoutchouc	—
Rhein-Chemie GmbH.	—
Robinson Bros. Ltd.	x
Robinson, Joseph, & Co. Ltd.	—
Rotunda Ltd	—
Rubber Age (New York) Ltd.	—
Rubber Latex Ltd.	186
Rubber Regenerating Co. Ltd. The,	Cover iv
Scott Bader & Co. Ltd.	—
Shaw, Francis, & Co. Ltd.	ii
Shell International Chemical Co. Ltd.	—
Shell Mex & B.P. Ltd.	—
Smith, Alfred, Ltd.	—
Smith, Wilfrid, Ltd.	—
Squire, Frederick, Ltd.	—
Stechler, L., & Co. Ltd.	201
Steel, J. M., & Co. Ltd.	—
Steele & Cowlishaw Ltd.	—
Stocker, W. B., & Co. Ltd.	viii
Storeys of Lancaster	—
Stott, James, Ltd.	—
Sutcliffe Engineering Components Ltd.	—
Sutcliffe Speakman & Co. Ltd.	—
Tanner Bros. (Greenfield) Ltd.	—
Tilghman's Ltd.	—
Union Carbide Ltd.	—
United Norit Sales Corporation Ltd.	—
United Wire Works Ltd., The	—
Universal Oil Co. Ltd.	—
Universal Oil Products Co.	—
Vacu-Blast Ltd.	vi
Verson Engineering Co. Ltd.	201
Wallace, H. W., & Co. Ltd.	—
Wallis Engineering Co.	—
Washington Chemicals	iii
Welwyn Tool Co. Ltd.	—
Witco Chemical Co. Ltd.	186
Zama Ltd.	—

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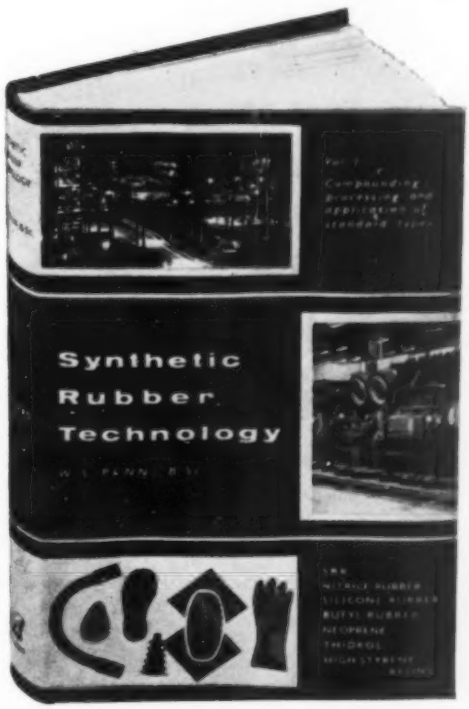

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